Focused Remedial Investigation/Feasibility Study Work Plan

Ford Road Landfill Site
Elyria, Ohio

Ford Road Landfill PRP Group
Houston, Texas

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BBL®
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1. Introduction

1.1 General

This document presents a detailed Work Plan for conducting a Remedial Investigation/Feasibility Study (RI/FS) to investigate the nature and extent of constituents of potential concern (COPCs) associated with the Ford Road Landfill Site (Site) in Elyria, Lorain County, Ohio (Figure 1) and to develop and evaluate potential remedial alternatives. The RI/FS will be conducted in accordance with the requirements of the Administrative Order on Consent (Docket No. V-W-02-C-702) executed between the Respondents and the United States Environmental Protection Agency (USEPA, 2002a).

This RI/FS Work Plan is consistent with the elements of an RI/FS set forth in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; 42 [USC] 9601 *et seq.*), as amended; the National Contingency Plan (NCP) of March 8, 1990 (40 Code of Federal Regulations [CFR] Part 300); and the USEPA guidance document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988).

1.2 Work Plan Organization

The RI/FS Work Plan is organized into the following sections:

Section	Purpose
Section 1.0 – Introduction	Provides a brief introduction, an overview of activities to be conducted in connection with the RI/FS, the organization of the work plan, and the objectives of this RI/FS program.
Section 2.0 – Site Background and Physical Setting	Presents a site description, a summary of historical site information, a discussion of topography and drainage, and a discussion of the geologic and hydrogeologic setting of the Site.
Section 3.0 – Summary of Previous Investigation Results & Conceptual Site Model	Presents a summary of previous investigation activities and results, as well as the conceptual site model.
Section 4.0 – Work Plan Rationale	Presents rationale for identifying and evaluating pathways of potential concern as part of this program. Establishes the specific data requirements to meet the RI objectives, describes how the data from the RI will be used. and defines the quality of the data required.

Section	Purpose
Section 5.0 – Remedial Investigation	Details the proposed RI task activities to be performed to assess current conditions with respect to the identification of conditions that represent a risk to human health or the environment. This section also details the preparation of an RI Report.
Section 6.0 – Screening-Level Risk Evaluation	Describes the proposed screening level human health evaluation and ecological risk assessment to be implemented in conjunction with the RI.
Section 7.0 –Feasibility Study	Provides an outline for the FS that will be prepared to assess potential remedial activities based on the results of the RI.
Section 8.0 – Project Schedule	Provides a timetable for completion of the RI/RA/FS work tasks.
Attachment 1	Quality Assurance Project Plan (QAPP), including Field Sampling Plan (FSP)
Attachment 2	Health and Safety Plan (HASP)

This Work Plan is supported by a QAPP that includes an FSP. The QAPP presents field procedures and sample collection methods, including analytical methods and quality assurance/quality control (QA/QC) procedures to be followed during the implementation of the RI. The Work Plan is also supported by a HASP that contains procedures and plans to be followed during the RI to protect the health and safety of field personnel.

1.3 RI/FS Objectives

The RI/FS objectives for the Site, as required under the Administrative Order on Consent (AOC), include the following:

- Identify remedial action objectives (RAOs) based on potential human health and/or ecological risks;
- Treat principal threat wastes, if necessary;
- Prevent migration of COPCs from source areas, including, if required, containment of contaminated groundwater within the waste boundaries;
- Prevent exposure to COPCs, including, to the extent necessary, improvements to the landfill cover at the Site;

- Return usable groundwater outside the waste boundary to beneficial use wherever practicable, within a timeframe that is reasonable given the particular circumstances of the Site; and

- Restore the Site to beneficial use, if practicable.

The AOC-stated strategy for the general management of the Site will include the following:

- Conduct an RI to determine the nature and extent of the release or threatened release of COPCs from the Site;

- Determine whether any Site-related COPCs are posing (or may pose in the future) an unacceptable risk to human health or the environment;

- Perform an FS to identify and evaluate alternatives for the appropriate extent of remedial action to prevent or mitigate the migration or release (or threatened release) of COPCs from the Site; and

- Conduct removal actions to address priority areas pursuant to the Order, any amendments thereof, and subsequently issued Orders.

2. Site Background and Physical Setting

2.1 General

The Ford Road Landfill Site is a 15-acre inactive facility located in Elyria, Lorain County, Ohio. The Site is located on the northern edge of Elyria on Ford Road, about 1.5 miles from interchange 8 of the Ohio Turnpike, Interstate 90. The Site is bordered by an intermittent stream and a sewer main that is covered with riprap to the north, a ravine and rural land to the south, the Black River to the east, and Ford Road and the Black River Preserve to the west. The approximate geographic coordinates of the Site are 41° 22' 26.0" N latitude and 082° 07' 30.0" W longitude. The USEPA spill identification number is 0574, and the USEPA facility identification number is OHD 980510002.

Based on recent site visits by Blasland, Bouck & Lee, Inc. (BBL) and Haley & Aldrich, Inc, (H&A) personnel, the conditions at the former landfill site appear stable. The former landfill appears to have an adequate cover of low-permeability soil across most of the landfill. Landfill wastes are largely covered, with the exception of some wastes, miscellaneous debris, and white goods that are located along the landfill flanks. The slope of the landfill sides typically ranges from approximately 2:1 to 3:1 (H:V). The landfill flanks appear to have healthy side-slope vegetation, with no signs of slope failure or instability (e.g., no observations of fissures, rotational slides, slumps, hummocks). No indication of landfill gas has been observed at the Site.

2.2 Site History

The landfill was originally a ravine that has been filled. The landfill began operation in the early 1900s. Brotherton Disposal Company, Brotherton Disposal, Inc., and Browning-Ferris Industries of Ohio, Inc. (BFIO) operated a landfill at the Site for various periods in the 1960s and early 1970s. In 1972, Brotherton Disposal, Inc. merged with BFIO. According to Lorain County Records, George C. Brotherton and Phyllis J. Brotherton, doing business as Brotherton Disposal and later as Brotherton Disposal, Inc., leased the landfill from Jack Joseph from 1964 to 1973. In 1973, Brotherton Disposal Inc. leased the landfill from the Lorain County Metropolitan Park District. The landfill ended operations in 1974. The current owner of the Site is the Lorain County Metropolitan Parks District.

The limited available records indicate that the landfill accepted municipal and various industrial wastes in drums and in bulk, including, but not limited to, the following wastes: 700 tons of hazardous materials, including heavy metals, other inorganic substances, and miscellaneous catalysts and insecticides; 3.3 million pounds of chemical wastes, including organics, solvents, resins, oils, sludges, elastomers, acrylates, and latex emulsions; and 32,000 gallons of sludge per day from 1963 to 1970. Some of the wastes were burned onsite. Foundry sand, slag, and dried sludges were used for cover material.

In 1993, with the approval of the USEPA and the Lorain County Metropolitan Park District, BFIO implemented a voluntary response action involving the addition and regrading of cover soil (including the placement of up to 8 feet of low-permeability cover materials) to intercept and contain reported observations of leachate emanating from the Site. In addition, some refuse observed near the river was removed and transported to the Lorain County Landfill.

2.3 Topography and Drainage

The Site topography may be characterized as a generally level surface at an elevation of approximately 690 feet above mean sea level (AMSL), extending east across the top of the former landfill surface from Ford Road, which forms the western boundary of the Site. The northern, eastern, and southern flanks of the former landfill slope steeply down to the flood plain of the Black River at an elevation of approximately 620 feet AMSL.

A swale, oriented approximately north-south, was constructed along the western edge of the former landfill to direct runoff into a stormwater drain that discharges into a crushed stone-filled drainage feature that extends from Ford Road to the Black River immediately north of the Site.

2.4 Geologic/Hydrogeologic Setting

The Site is located within the Berea Headlands section of the Huron-Erie Lake Plains physiographic region of Ohio (C.S. Brockman, 4/98). The near-surface geology in the Site vicinity is generally characterized by the presence of glacially derived, wave-planed, ground moraine deposits from the Wisconsinan epoch and more recent lake deposits. The overburden materials encountered in the subsurface at this Site consist primarily of gray to brown silty clay and clayey silt, with trace to some sand and gravel. Bedrock was encountered at depths ranging from 12.5 to 28.5 feet below grade and is composed of red to black, fissile shale. The shale bedrock formation encountered below the Site is probably a member of the Bedford Formation. Boring logs of wells in the general Site vicinity also observed red and black shale bedrock to depths of up 100 feet below grade. Bedrock does not appear at the ground surface or along the bank of the Black River onsite, whereas an outcrop of red shale is evident along the access road to the south and black shale is visible in the bank of the Black River opposite the Site.

Groundwater has been encountered within the shallow overburden materials above the bedrock at three monitoring wells located along the eastern toe of the former landfill. Groundwater present above the bedrock in the Site vicinity would be expected to flow generally to the east and discharge into the Black River, which forms the east site boundary. Available logs for wells located in the general Site vicinity indicate that the shale bedrock has low hydraulic conductivity, with developed capacities reportedly ranging from 0 gallons per minute (gpm) to 30 gpm. The groundwater flow from the Site would be expected to discharge to the Black River at the downgradient edge of the Site.

3. Summary of Previous Investigation Results & Conceptual Site Model

3.1 Previous Investigation Results

The following is a summary of the results of the previous investigations of the Site on which the current understanding of site conditions has been based. The available records of previous investigations include the following:

- Sanitary Landfill Inspection, Ohio EPA, December 21, 1972;
- Site Inspection Report, Ecology & Environment (E&E) (for USEPA), September 30, 1980;
- Laboratory Data Reports, USEPA, October 20, 1980;
- Potential for Groundwater Contamination, E&E (for USEPA), October 16, 1981;
- Preliminary Assessment Report, E&E (for USEPA), January 5, 1983;
- Site Inspection Report, E&E (for USEPA), July 20, 1983;
- Expanded Site Inspection Report, PRC Environmental Management, Inc. (for USEPA), January 10, 1994; and
- BFI Landfill Gas Monitoring, February 8, 1989 through January 31, 1994.

The sanitary landfill inspection form reported conditions observed at the landfill on December 21, 1972, by Howard Stiver of the Ohio Environmental Protection Agency (OEPA) including the presence of leachate near the southeast corner of the landfill and observed that insufficient cover material had been applied. An inspection of the landfill in June 1976 documented improved conditions, although it indicated continued concerns regarding adequacy of cover and an observation of leachate in the southeast corner of the landfill.

On September 30, 1980, a site inspection was performed by Robert Bartholomew of Ecology & Environment on behalf of the USEPA. During the inspection, leachate was reportedly observed to be entering Black River at the northeast corner of the Site. The USEPA files contain analytical results (dated October 20, 1980) for both a leachate sample and a sediment sample that were collected from observed seepage points located between the northeastern toe of the landfill and the Black River. The analytical results of these two samples are summarized on Table 3.1. The leachate sample contained detectable concentrations of ammonia, lead, boron, cadmium, zinc, barium, chromium, titanium, tetrahydrofuran, dimethylbenzene, ethylbenzene, 3,3,5-trimethylcyclohexanone, trimethylcyclohexanol, 1,1 oxybisbenzene, methylenebisbenzene, and bis(2-ethylhexyl)phthalate. The sediment sampled contained bis(2-ethylhexyl)phthalate, phenol, methylphenol, 1H-Indole, tetradecanediols, and polychlorinated biphenyl (PCB).

An Evaluation of the Potential for Groundwater Contamination at the Ford Road Site was prepared by Ecology & Environment on behalf of the USEPA, dated October 16, 1981. This assessment concluded that, although impacts to the deeper bedrock aquifer were unlikely due to the relatively impermeable shale cap rock and potential impacts to groundwater in the overburden could impact the Black River and should be evaluated through the installation and sampling of four to five wells.

On August 23 and 24, 1982, three shallow overburden monitoring wells (MW-1, MW-2 and MW-3) were drilled and installed by ATEC at the locations indicated on Figure 2. A borehole was also advanced up gradient of the Site; however, no groundwater was encountered above the shale bedrock and no monitoring well was installed at this location.

A preliminary assessment of the Ford Road Site was prepared by E&E on behalf of the USEPA, dated January 5, 1983 (E&E, 1983a). Based on an evaluation of available information from the field investigation team (FIT) files, OEPA files, and USEPA Region 5 files, additional information was considered necessary to assess potential impact on groundwater, surface water and/or soil.

On July 20, 1983, during a site inspection, E&E collected groundwater samples from each of the three existing monitoring wells at the Site on behalf of the USEPA. The analytical results of these groundwater samples are summarized on Table 3.2. Two of the samples were found to contain low concentrations of acetone and alpha-benzene hexachloride (alpha-BHC). A third sample contained methylene chloride.

On January 10, 1994, a USEPA contractor, PRC submitted the *Expanded Site Inspection Report*. The activities completed by PRC included an inspection of the Site on March 8, 1993, during which a leachate seep was observed flowing toward the Black River near the northeast corner of the Site. On May 18, 1993, PRC sampled soil, surface water, sediment, and groundwater at the Site. The analytical results of the soil and sediment samples are summarized on Table 3.3. Arochlor-1254, delta-BHC, alpha chlordane, calcium, lead and zinc were detected in one or more sediment samples. Analytical results of the surface water samples are summarized on Table 3.4. These results did not identify any hazardous substances at levels above background. The analytical results of the groundwater samples are summarized on Table 3.5. Acetone, 1,1-dichloroethene, potassium, and sodium were detected in one or more of these groundwater samples. Arsenic, barium, manganese, and nickel were also detected at elevated concentrations in both sediment and groundwater.

BFIO conducted monthly methane gas monitoring from February 8, 1989 through January 31, 1994. This monitoring program involved the monitoring for methane gas at 10 locations across the landfill during each monitoring event. The monitoring results showed 0% of the lower explosive limit (LEL) and 0% by volume from all locations during each monitoring event implemented. Documentation of this landfill gas monitoring program will be provided under separate cover.

3.2 Conceptual Site Model

The following presents a conceptual site model of the Ford Road Landfill Site that has been developed based on the information generated in connection with the previous investigations summarized in the proceeding section. The conceptual site model addresses the current site conditions and the potential for COPCs associated with the Site to result in risks to human health or the environment.

The current conditions at the Ford Road Landfill Site appear to be stable. Since the active landfill operations ended in 1974, substantial work involving the placement and regrading of additional cover material was performed by BFIO in 1993 to resolve issues identified during inspections of the landfill related to cover adequacy and observations of leachate seeps. Subsequent inspections of the Site indicate that the landfill is covered, with only small amount of exposed waste along the north and south slopes of the landfill, and that a healthy vegetative growth has developed on the landfill surface and slopes. Burrowing mammals may also have brought subsurface waste materials to the surface. Surface water runoff resulting from precipitation to the surface of the landfill enters a surface water control system which discharges to Black River or to drainage ways located adjacent to the Site that discharge to the river. The presence of a continuous cover across the landfill is functioning to mitigate direct contact of surface water with waste materials disposed in the landfill. The geologic setting in the site vicinity is characterized shallow overburden deposits composed of clayey silts, silty clays, sandy silts, silts and clayey sands underlain by a thickness of at least 50 feet of shale bedrock. Groundwater flow in the bedrock aquifer is not anticipated to be impacted by the landfill due to the relatively impermeable nature of the shale cap rock underlying the Site. Groundwater flow within the overburden deposits underlying the Site would be expected to discharge to the Black River.

4. Work Plan Rationale

4.1 General

This Work Plan has been prepared by the Ford Road potentially responsible parties (PRPs) for submission to the USEPA. The Work Plan has been developed as an outcome of Project Planning tasks, which included collection and analysis of existing data and site visits. The Site has been considered for the National Priorities List (NPL) based on observations and reports of site conditions from the early 1970s through 1993. In 1993, BFIO undertook measures to mitigate issues associated with the Site resulting in surface water drainage controls and site capping with low permeability materials and vegetation. Two recent site visits by BBL and H&A personnel have indicated that leachate seeps, which were reported in the past, currently are not apparent and the Site appears to represent no threat to human health and the environment based on site observation and evaluation of historical data. In order to verify this opinion, the Work Plan tasks have been developed to facilitate appropriate sampling and analysis to characterize current site conditions adequately to assess potential pathways of concern (i.e., groundwater, surface water, or sediment) and indicate whether impacts exist that would require actions on behalf of the PRPs to reduce or eliminate human health and ecological risks.

The investigation of this Site will require the collection and evaluation of sufficient data to describe the physical and biological characteristics of the Site, potential source characteristics, the nature and extent of contamination, and contaminant fate and transport, to the extent necessary. This evaluation is used to determine if there are any risks to human health or ecological receptors, and if any such risks require some form of further response. In order to understand the potential ability of any constituents on the Site to exhibit risk, the various pathways through which risk can be expressed must be determined.

4.2 Rationale of Migration/Exposure Pathways to be Considered

Several potential migration and/or exposure pathways have been identified by the USEPA and the OEPA at the Ford Road Landfill Site as requiring some form of investigation. It should be noted that substantial evidence already exists to indicate that most of the identified pathways have been addressed by previous remedial activities at the Site and conclusions drawn by both agencies in previous evaluations also stated no direct exposure routes exist at the Site. However, recent USEPA and OEPA inspections indicate that waste materials are exposed along the slope of the landfill and may also present a direct exposure pathway.

The primary migration and/or exposure pathways of potential concern to be evaluated at the Ford Road Landfill Site include:

- Direct exposure to soil and waste materials;
- Consumption of groundwater in the vicinity of the Site;
- Exposure to groundwater discharged to the Black River;
- Exposure to surface water and associated solids runoff to the Black River;
- Exposure to Black River surface water and sediment; and
- Inhalation of gaseous releases.

Each of these pathways is further discussed below.

(1) Direct exposure to soils and waste materials

The Ford Road Landfill received a variety of waste materials for disposal during its operating period. Since closure activities were initiated in the early 1970s and through additional site management activities over the past 20 years, all waste materials have been consolidated within a known footprint area and have been covered with sufficient soil materials to prevent any direct contact by humans or ecological receptors. Recent site visits by BBL and H&A personnel have confirmed that the landfill is mostly covered, exposed waste is limited to some materials observed along the north and south slopes of the landfill, and that a healthy vegetative growth has developed on the landfill surface and slopes. The site investigation will provide a basis to evaluate the completeness and sufficiency of the existing cover. These results may then be used to assess the need for evaluating the direct exposure pathway to contaminated soils and waste material (for human and/or ecological exposure) in the RI/FS.

(2) Consumption of groundwater in the vicinity of the Site

The Site is underlain by clayey silts, silty clays, sandy silts, silts and clayey sands, with depths to bedrock ranging from 12.5 to 28.5 feet. Municipal water sources are available to, and used by, local residents. No known consumers of groundwater in the immediate vicinity of the Site have been identified in any of the previous investigations conducted by various parties. An OEPA survey in the late 1990s (Mohr) concluded that local residents were not at risk from any of the compounds detected in groundwater at the Site. This investigation will be used to confirm the lack of current groundwater consumers. In addition, appropriate institutional controls will be evaluated as a method of eliminating the potential for future groundwater consumption.

(3) Direct exposure to groundwater discharged to the Black River

Groundwater passing through or under the Site would be discharged to the Black River directly through the banks and bed of the Black River, or through expressions of leachate seeps from slope areas near the river. Previous investigations, conducted prior to site closure and management activities, have reported the presence of leachate seeps along the eastern slope of the landfill. The most recently reported seep was observed during a preliminary site walk conducted by PRC for the USEPA in 1993, although the mapped location of the reported seep seems to place it on the opposite bank of a drainage way along the north boundary of the Site. The location of the "seep," on the opposite side of a hydraulic barrier, and the fact that the seep was not present when PRC returned to sample it a short time later, would lend some uncertainty as to whether it is representative of broader conditions at the Site. The improvements to the cap through the placement of additional low permeability cap materials in conjunction with surface water control improvements in 1993, would have reduced the potential for infiltration of water and generation of leachate at this Site. No seep observations have been reported since the 1993 site walk, and recent inspections have revealed none of the common indicators of active or intermittent leachate seeps or groundwater discharge points (e.g., stressed vegetation, upwelling or eroded areas, visible staining).

Mass-loading calculations using the existing groundwater data, to perform a worst-case analysis of the potential risk that could be attributable to constituents present in groundwater that may discharge to the Black River, have shown that even at maximum detected concentrations, no exceedences of aquatic water quality standards would be expected. To confirm these preliminary conclusions, a groundwater investigation program will be developed to provide data on the constituent concentrations and flow conditions.

(4) Surface water and associated solids runoff to the Black River

Substantial and effective management measures have been put into place at the Site to maintain the integrity of the cover materials and to ensure surface water runoff and any solids carried by any runoff is directed to the surface water control system. The surface water control system conveys runoff to Black River or to nearby drainage ways that discharge to the river. Site inspections have demonstrated that the cover is functioning as designed and required, and that direct contact of surface water with waste materials disposed in the landfill has been mitigated. Confirmation of the proper functioning of these features will be performed.

(5) Exposure to Black River surface water and sediment

Although several COPCs were detected within the surface water and sediment of the Black River during previous investigations, these concentrations are likely not attributed to discharges from the Site. As discussed above, even when considering, on a worst-case basis, the direct discharge of groundwater containing maximum detected concentrations of Site-related constituents, no exceedences of human health or ecological receptor-based water quality standards were identified. Similarly, sediments have been sampled at locations upstream (background), near the Site, and at the downstream boundary of the Site. Of the greater than 100 parameters analyzed, only seven were found at concentrations above those in the upstream sample. To confirm that potential human and/or ecological exposure to Black River surface water and sediment is not a pathway of concern at this Site, additional samples will be collected and analyzed. Analytical data will be compared to Ohio EPA water quality standards and appropriate sediment screening values. In addition, if elevated levels of bioaccumulative COPCs are identified, than additional exposure pathways (e.g., ingestion of fish) will also be evaluated.

(6) Inhalation of gaseous releases

A previous investigation of landfill gas generation at the Site involving five years of soil gas monitoring concluded that gas generation is not a concern at the Site. In addition, recent site observations have confirmed the absence of any indication of gas generation occurring at the Site (e.g., no stressed vegetation, visible staining, or rupture points). To confirm that the cover on the Site is functioning properly, including the prevention of gaseous releases, the investigation program will include specific observations of any evidence of gas production. Information confirming the lack of significant evidence of gas releases would be used to address this potential pathway.

4.3 Rationale of Specific RI/FS Tasks to be Implemented

4.3.1 Site Data Gaps

Existing data gaps include the need to evaluate the effectiveness of the existing remedy and to update existing data to assess the groundwater, surface water, and sediment exposure pathways associated with the site. The main objectives of this Remedial Investigation are to obtain information to allow for the evaluation of the current remedy, its effectiveness and appropriateness, and to obtain information to determine current and future quality of soil, groundwater, surface water and sediments and their related exposure pathways. Information that will be collected to fill these gaps, along with associated rationale, is summarized in this section. The investigation plan that was developed from these data quality objectives is provided in Section 5.0.

4.3.2 Evaluate Existing Conditions

The existing condition consists of the landfill cover and associated stormwater drainage structures. In general, landfill covers are engineered to accomplish the following:

- Mitigate movement of liquids though the cover and landfill;
- Mitigate cover maintenance;
- Promote drainage; and
- Mitigate cover erosion or abrasion.

Further, the remedy at this site must also be protective of human health and the environment. Specifically, this remedy must accomplish the following:

- Mitigate human and ecological direct contact with waste material;
- Mitigate leachate generation;
- Mitigate impacts to groundwater and surface water bodies; and
- Mitigate the potential for landfill gas generation and migration.

To assess the existing conditions with respect to the above criteria, the following will be evaluated

- Cover material;
- Slope stability;
- Surface water infiltration;
- Surface water management structures;
- Potential for landfill gas generation and migration; and
- Erosion and flood protection.

The data quality objectives and rationale for the collection and analysis of this data are included in the following sections. The Ohio DSIWM guidance documents 0111 and 0123 will also be considered in evaluating the existing landfill cover.

4.3.2.1 Cover Evaluation

The existing cover will be assessed to determine whether it meets the evaluation criteria discussed in Section 4.3.2. The evaluation will focus on cover thickness, permeability, compaction, and physical characteristics. Each of these, as described below, controls surface water infiltration into the landfill which subsequently controls the leachate production in the landfill and subsequent impact to surface water and groundwater.

Surface and Subsurface Soil Sampling

The condition of the surface and subsurface soils need to be characterized to facilitate the evaluation of the direct contact pathway of potential concern at the site. Therefore, surface and subsurface soil samples will be collected for laboratory analysis from selected locations across the site as described in Section 5.0. These samples will be collected from locations selected to be most likely impacted by exposed waste which has been reported to exist along the slopes of the landfill.

Cover Thickness Measurement

Cover thickness, along with cover permeability and compaction, is a key component of infiltration control at this site. Thickness of the cover is believed to be at least two feet; however, verification of cover thickness is necessary to evaluate cover performance. The thickness of the cover material will be measured at locations across the landfill as described in Section 5.0. These measurements will be taken to determine whether the current cover precludes direct contact with waste material and minimizes infiltration of surface water, subsequent generation of leachate, and leachate impact, to surface water and groundwater. These measurements will also be made to evaluate whether the current cover is of sufficient thickness to minimize future maintenance requirements.

Permeability Testing

Cover permeability is directly related to infiltration capacity; therefore, cover permeability must be measured evaluate infiltration at the site. The permeability of the cover material will be measured at locations across the landfill as described in Section 5.0. These measurements will be taken to determine whether the current cover is of sufficiently low permeability to minimize infiltration of surface water, subsequent generation of leachate and leachate impact, to surface water and groundwater. This information will also be used in the infiltration evaluation, as input into the modeling program, TR-55, as discussed below and in Section 5.

Compaction Evaluation

Like permeability, cover compaction is integral to cover performance. The compaction of the cover material will be measured and evaluated at locations across the landfill, as described in Section 5.0. Unit weight, moisture and moisture / density relationship testing will be completed to determine whether the current cover is sufficiently compacted to minimize infiltration of surface water. The moisture density relationship testing provides a theoretical "compaction curve" for the cover material, against which the actual compaction of the in situ material can be compared. In general, the compaction of the in-situ material should approach 90 to 98 percent of the ideal maximum, to be most effective.

Physical Characteristic Testing

The cover characteristics play an important role in cover performance including cover stability and longevity. The physical characteristics of the cover material will be measured at locations across the landfill as described in Section 5.0. These grain size distribution and Atterberg Limit tests will be completed to ascertain whether cover material is of sufficient nature and type to minimize future maintenance, and to minimize infiltration of surface water. In general, cohesive and fine grained soils are preferred cover material as these materials typically exhibit low permeability.

Evaluate Infiltration

Infiltration of surface water into landfills causes leachate generation and may impact groundwater and surface water, through direct contact or seepage. To evaluate the infiltration into this landfill, the data gathered in the above steps, along with annual precipitation data from the National Weather Service will be input into the EPA's Hydraulic Evaluation of Leaching Performance (HELP) model, as described in Section 5. The HELP model calculates infiltration of precipitation through the existing landfill cover.

4.3.2.2 Evaluate Slope Stability

The long-term adequacy of the existing landfill cover system includes an evaluation of slope stability. Long-term stable side slopes are a requirement for any in-place remedy selected for this site. Accordingly, the existing landfill slope will be evaluated to determine whether it is stable and to ascertain if it will minimize future maintenance and be protective of direct contact with waste and impact to surface water. To evaluate slope stability, a topographic survey of the site will be made, as described in Section 5.0. This map will be evaluated for evidence of slope failure. Further, a site inspection will also be conducted to identify evidence of slope failure. Based on this information, existing historic information, physical characteristics of the cover material and underlying site geology, a determination will be made of stability of the slope and on any additional augmentations that may be required to ensure long-term slope stability.

4.3.2.3 Evaluate Surface Water Management

The site surface water management structures will be evaluated to determine whether these structures adequately promote the drainage of surface water away from the landfill area. Rapid drainage of surface water minimizes infiltration, subsequent leachate production and related potential surface water and groundwater impact. To evaluate the site surface water management structures, these structures will be inspected to determine whether scouring or silting is currently occurring. Scouring in these structures would be evidence that surface water flow is too rapid, while silting would be evidence that surface water drainage is too slow. Further, the peak flow rates and velocities from a 25-year occurrence, 24-hour duration storm event will be calculated using the TR-55 model. The existing stormwater structures will then be evaluated to determine whether they can manage this design storm event. The results of this evaluation would either indicate that the existing structures are sufficient or would indicate that expansion or augmentation needs to be completed. Activities to be conducted to complete this evaluation are described in Section 5.

4.3.2.4 Define Potential for Gas Generation and Migration

The potential for explosive gas generation is a typical issue at closed landfills. Migration of gas to off-site areas is a major concern; therefore, the potential for gas generation and migration will be evaluated. Evaluation will consist of review of historical gas monitoring data, screening of soil borehole for explosive gases, and results of a site inspection. If any of these indicate that the potential for gas generation and migration exists, further steps to define this issue and satisfy this objective will be taken.

4.3.2.5 Assess Erosion and Flood Protection

Because this landfill is located adjacent to Black River, flood and erosion protection of the landfill will be evaluated. Flood elevations, flow velocities and flow rates of the Black River will be calculated from publicly available sources and measurements made during the collection of water samples. This information, along with information obtained during this study on the physical characteristics of the cover material, will be used to determine whether portions of the landfill below the flood elevation are subject to erosion from flooding. If this assessment indicates that erosion is possible, additional activities to delineate this potential will be recommended.

4.3.3 Evaluate Current Soil, Groundwater, Surface Water and Sediment Pathways

A major objective of this Remedial Investigation is to evaluate soil, groundwater, surface water and sediment pathways. To evaluate these pathways, the following activities will be completed:

- Evaluate current soil quality;
- Determine current groundwater use;
- Evaluate potential future groundwater use;
- Evaluate current groundwater quality;
- Evaluate the potential of landfill water impacts to groundwater;
- Assess potential for leachate seeps; and
- Evaluate current surface water and sediment quality.

Data obtained from these individual tasks, when compiled, will allow for a thorough evaluation of the current groundwater, surface water and sediment pathways. Further, data obtained during these tasks will aid in evaluation of the effectiveness of the current remedy.

4.3.3.1 Evaluation of Current Soil Quality

As discussed above, the condition of the surface and subsurface soils need to be characterized to facilitate the evaluation of the direct contact pathway of potential concern at the site. Therefore, surface and subsurface soil samples will be collected for laboratory analysis from selected locations across the site. These samples will be collected from locations selected to be most likely impacted by exposed waste which has been reported to exist along the slopes of the landfill.

In addition, background soil samples will be obtained from locations in the site vicinity which have not been impacted by the landfill operations.

4.3.3.2 Evaluation of Current Groundwater Use

The potential for exposure of local groundwater users to impacted groundwater, potentially emanating from this site must be defined. To determine whether any groundwater receptors exist adjacent to or on the site, the current groundwater use in the site vicinity will be evaluated. This evaluation will consist of defining a study area, compiling a list of residences and addresses within this area ("windshield survey"), obtaining publicly available water well logs, and obtaining City Water Department records. After these data are obtained, they will be compared. The results of this comparison will define potential groundwater users and will provide information on current groundwater use in this area.

4.3.3.3 Evaluation of Future Potential Groundwater Use

Just as current groundwater use is a concern, future potential groundwater use is also a concern. To determine the potential for future groundwater use, the deeds to the site and adjacent properties will be evaluated to determine whether there are deed restrictions on groundwater use exist. Further, local ordinances will also be researched to determine if any groundwater use ordinances exist. Assessment of the potential for future groundwater use restrictions, either through deed restrictions or ordinances, will also be completed. Finally, the water-bearing properties of the underlying aquifer will be evaluated to determine whether it can provide sufficient yield to support water use.

4.3.3.4 Evaluation of Current Groundwater Flow and Quality

Groundwater flow direction and quality must be characterized to evaluate the potential risk to human health and the environment associated with this media. To evaluate the current groundwater quality and flow direction, direct-push methods and monitoring wells will be installed at the site as described in Section 5. These wells will allow for determination of groundwater flow and quality upgradient and downgradient of this site. In addition, the data collected will be used to evaluate groundwater flow rates and the groundwater – surface water relationship.

4.3.3.5 Assess Potential for Landfill Seeps

Landfill seeps are often related to surface water infiltration. These seeps often directly impact the quality of surface water and groundwater and may be indicative of infiltration of surface water through the current cover. Therefore, the presence of landfill seeps will be determined. The landfill will be inspected for the presence of seeps. If any seeps are observed, their locations will be noted and the seep liquid will be sampled. Sampling will be completed by surface water sampling methods described in the Field Sampling Plan.

4.3.3.6 Evaluate Current Surface Water and Stream Sediment Quality

The current quality of surface water and stream sediment in Black River will be determined upstream, downstream and adjacent to the site. These data will be used to indicate whether the site impacts or has impacted these media within Black River, as described in Section 5.0. These data are important in determining whether the current remedy is effective at minimizing impacts to surface water and sediments.

Surface Water Sampling

As discussed in Section 3, USEPA, OEPA and their contractors have collected samples of surface water from the Black River in the immediate vicinity of the Site on several occasions in the past. These samples were collected from areas immediately adjacent to the discharge point from the surface drainage system, an upstream or background location, and an area immediately downstream of the site boundary. Analytical results from the samples did not reveal the presence of constituents that can be reasonably attributed to the Site.

Since Site-related constituents have not been found in waters of the Black River, the water quality data collection component of the RI will be focused on the confirmation of this observation. Samples will be collected from the same general vicinity of the sample locations used in the previous investigations, with the addition of sample locations further upstream and downstream of the site. Data collected from these surface water samples will also be used, as necessary, for the assessment of human health and ecological risks at the Site.

Sediment Sampling

As discussed in Section 3, USEPA, OEPA and their contractors have collected sediment samples on several occasions from the nearshore areas of the Black River in the immediate vicinity of the Site. Detections of potentially Site-related constituents have been rare, and the magnitudes of detected concentrations, when compared to concentrations in background samples, have shown insignificant ratios for all but one compound in one sample.

The focus of the sediment sampling component of the RI will be twofold: 1) to confirm the observations made during previous investigations that constituents potentially attributable to the Site are not present in significantly enriched concentrations above background; and 2) to provide constituent concentrations in surficial sediments for use in the assessment of risks due to human health or ecological exposure to the sediments of the Black River that may potentially have been impacted by the Site. Samples will be collected from the same general vicinity of the sample locations used in the previous investigations.

4.4 Data Quality Objectives

As described above, work tasks conducted for the RI will entail the collection and laboratory analysis of soil, groundwater, and sediment samples. The QAPP (included as Attachment 1 of this Work Plan) specifies the appropriate field procedures and appropriate analytical procedures and data quality required to meet the objectives of the RI/FS.

5. Remedial Investigation

5.1 General

This section describes in detail the investigation tasks that will be completed and information / data that will be collected during the RI. Table 5.1 summarizes the tasks and the anticipated resultant data. Rationale for the collection of these data and related data quality objectives were presented previously in Section 4. The methods used to collect these data are summarized in the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP).

TABLE 5.1
SUMMARY OF REMEDIAL INVESTIGATION TASKS

Data Gap	Data Need	Analytical Program
Evaluate Existing Conditions	Evaluate Existing Cover	Install soil borings to measure thickness of cover, and allow collection of samples to evaluate the permeability, compaction, and physical characteristics of the cover material
	Evaluate Slope Stability	Conduct a site survey to generate site topographic map and perform inspection of the landfill slope, for evidence of slope failure. Evaluate slope stability
	Evaluate Surface Water Management	Assess peak flow from 25-year, 24-hour storm event, calculate flow volumes from this event using TR-55 model and assess / inspect current surface water conduits for silting and scouring. Evaluate the capacity of the current surface water management system to handle the 25-year storm event.
	Evaluate Explosive Gas Potential	Review historical gas monitoring information, screen soil boreholes for explosive gases, and complete an inspection of the landfill area to evaluate the potential for current explosive gas generation and the potential for gas migration.
	Evaluate Erosion and Flood Protection	Evaluate flood volumes and velocities for the Black River. Determine whether the landfill portion that is below flood evaluation is subject to erosion, based on the physical characteristics of the cover and the river flood dynamics.

Data Gap	Data Need	Analytical Program
Evaluate Soil, Groundwater, Surface Water and Sediment Pathways	Evaluate Current Groundwater use	Complete a drive-by reconnaissance of the area in the vicinity of the site and compile address list of residences in this area. Collect existing public information on potable water well logs to identify potential groundwater users. Search city water customer records to identify current city water users. Compare records to addresses that are identified by drive-by reconnaissance to identify potential groundwater users and confirm usage, as possible.
	Evaluate Potential Future Groundwater Use	Research current deeds of site and vicinity to determine whether restrictions on groundwater usage exist. Research local ordinances for restrictions on groundwater use. Assess potential for future groundwater use restrictions (ordinances, deed restrictions). Assess the aquifer characteristics of underlying water bearing units to determine if yields support water supply development.
	Evaluate Current Groundwater Quality and Flow	Install upgradient and downgradient monitoring wells to assess groundwater quality adjacent to the landfill. Conduct slug testing on all new wells to define aquifer characteristics. Perform periodic groundwater level monitoring and sampling to define groundwater characteristics. Properly seal existing wells, as necessary.
	Assess Potential for Leachate Seeps	Review historical seep information and inspect site for presence of leachate seeps. Collect / analyze seep samples if present.
	Evaluate Current Surface Water and Stream Sediment Quality	Collect and analyze surface water and sediment samples to evaluate Black River quality at locations upstream, downstream and adjacent to the site; assess potential impact to these areas from historic site operations.
	Evaluate Potential Direct Contact Exposure to Soil	Collect and analyze soil samples, and evaluate the thickness of the cover material.

5.2 Evaluate Existing Conditions

A crucial objective of the RI is to evaluate the existing conditions to determine whether they are protective of human health and the environment. The existing conditions currently includes the existing cover and related surface water management structures.

The results of the evaluation of these conditions provide the basis for scoping of additional activities that may need to be performed. Therefore, this evaluation will focus on key characteristics of the existing conditions to determine effectiveness (both short-term and long-term) and protectiveness (to both human health and the environment). The key items to be evaluated include: the characteristics of the existing cover; stability of landfill slope; surface water management features; the potential for landfill gas generation and migration; and flood and erosion protection measures and the potential for contaminant migration to media including groundwater, surface water, sediments and soil. Activities designed to evaluate each of these characteristics are described in the following section.

5.2.1 Evaluate Existing Cover

The existing landfill cover, which is approximately 15 acres in area, will be evaluated to determine its effectiveness in mitigating the direct contact with underlying wastes and minimizing generation of leachate and other parameters as discussed in Section 4.3.2. This evaluation will include surface soil sampling, measuring cover thickness, permeability, density (compaction), and composition of the cover, as well as modeling of the potential infiltration of precipitation into the landfill. The data summarized in Table 5.2 below will be collected as a part of the RI. Modeling is described afterward.

TABLE 5.2
EXISTING COVER EVALUATION SAMPLING AND RATIONALE

Data Need	Description	Test Method
Condition of Surface and Subsurface Soil	To facilitate the evaluation of the direct contact pathway of concern, a total of 12 surface soil samples and 12 subsurface soil samples will be collected to be analyzed for COPCs. The surface soil samples will be collected from the 0 to 2 foot interval while the subsurface soil samples will be collected from the 4 to 6 foot interval or the 2 foot interval immediately above the base of the cover materials in the event either waste materials or bedrock is encountered prior to reaching a depth of 6 feet. Sampling locations will be determine in the field and will be biased towards areas at which exposed waste are observed. It is anticipated that the sampling locations will include 4 locations on the south slope, three locations on the east slope, three locations on the north slope and two locations near the western boundary.	
Thickness of the cover material	To determine the effectiveness of the existing landfill cover, the extent/ thickness of the cover needs to be measured. To determine the thickness of the existing soil/clay landfill cover, soil borings will be drilled at 15 locations within the covered area (one per acre, based on randomly selected locations defined in the field). A thin-wall sampling tube (Shelby Tube) will be advanced at the surface (just beneath vegetation) in each of these areas. Further, the borings will be continued to define the extent of cover thickness, by advancing the "split-spoon" sampling device until the thickness of the cover material is defined. Visual inspection of the boring samples will be used to determine total cover thickness.	D1587-00

Data Need	Description	Test Method
Permeability of cover material	To determine the effectiveness of the existing landfill cover at preventing infiltration of surface water into the landfill and subsequent leachate generation, the hydraulic conductivity of the existing cover material will be measured. A total of 15 thin-wall sampling tubes (at locations described above) will be collected and evaluated. Hydraulic conductivity testing will be measured, by the laboratory, on these samples. Infiltration rates will also be measured using field infiltrometer tests at five selected locations.	D5087-00 D3385-94 D5093-90
Moisture Content and Unit Weight	The moisture content and unit weight of the in-situ cover material will be used to determine compaction of the existing cover. Moisture content and unit weight will be measured on the 15 samples collected from the thin-wall tubes.	D2216-98
Moisture-Density Relationship	Standard proctor testing will be performed to determine the moisture density relationship of the cover material. This information will provide a "curve" that will be used as a comparison to evaluate current compaction of fill material. Bulk samples of this material will be obtained from sampling locations described above.	D698-00a
Grain Size distribution of cover material	Characterize the cover material with grain size distribution. To determine composition / grain size of cover material, sieve and hydrometer analysis will be conducted on bulk samples collected from each of the 15 locations described above.	D422-63
Atterberg Limits of cover material	Characterize the existing cover material with Atterberg limits testing. Atterberg limit testing on each of the samples from thin- wall tubes will be performed.	D4318-00

To evaluate the infiltration of water into this landfill, the data gathered from analysis of the cover material, as described in the above steps, along with annual precipitation data from the National Weather Service will be input into the EPA's Hydraulic Evaluation of Leaching Performance (HELP) model. The HELP Model will be used to evaluate the water balance characteristics and efficiency of the existing cover system at the Ford Road Landfill. The HELP Model calculates the water balance by considering water runoff over the top of the topsoil/cover soil layer, evapotranspiration of water within a specified depth of the topsoil/cover soil layer, lateral drainage of water within the drainage layer, and vertical percolation or leakage of water through the clay barrier layer and subsequent layers.

An upgrade to meet 1976 cap requirements is an assumption of the risk assessment which limits the potential for direct exposure to subsurface soil and waste. Areas of the cap that are to be replaced or repaired will be constructed to meet the specifications in Ohio DSIWM guidance documents 0111 and 0123. The application of a deed restriction to this property is also assumed to limit potential future exposure to subsurface soil and waste in addition to the potable use of groundwater at the site.

5.2.2 Evaluate Slope Stability

A detailed evaluation of current slope conditions will be performed including review of the topographic survey to be completed at the site. This evaluation of current stability will be considered in conjunction with the historic observations of slope conditions. Activities to be conducted as a part of this evaluation are described below.

Survey topography of the site

Site topography will be surveyed using either aerial photogrammetry and / or land surveying methods. The topographic map will have a scale of one-inch equals forty feet and have a contour interval of one foot.

Evaluate the site survey

A professional civil or geotechnical engineer will evaluate the topographic survey to determine whether evidence of landfill slumping or failure has is present. The survey will also be evaluated with respect to current and future stability issues,

Inspect and evaluate the existing landfill slope configuration

The existing landfill slope will be inspected and evaluated. The inspection will consist of an on-site inspection by a professional engineer for evidence of failure, slumping, condition of existing vegetation or other related stability issues. Information gathered during this inspection will form the basis of an evaluation of the existing slope configuration.

Evaluate underlying geology and groundwater conditions

In addition to the preceding calculations, slope stability is also a function of the groundwater conditions within and adjacent to the landfill and of the underlying site geology. Site geology and groundwater conditions will be evaluated to determine their impact on the stability of the existing slope. Existing site geology and groundwater information will be used to the extent possible, and augmented by information obtained during the RI field effort.

Provide analysis of above factors as an evaluation of slope stability

Utilizing the above information, a weight-of-evidence evaluation of the stability of the slope will be made. This analysis will provide a summary of the findings of the site inspection and topographic survey evaluation, as well as conclusion and recommendations based on these findings, as outlined in the RI report.

5.2.3 Evaluate Surface Water Management

An evaluation of the existing surface water management features (run-on and run-off) of the landfill will be completed. This assessment will be conducted to determine whether existing storm water structures can accommodate peak flow, minimize silting and scouring, prevent ponding of storm water, and divert surface water away from the landfill (to reduce infiltration). Activities to be conducted as a part of this evaluation include the following:

Assess peak flow from a 25-year, 24-hour storm event

Determine peak surface water flow rate and velocities that would be expected to be observed during a 25-year occurrence, 24-hour duration storm event. This assessment will be based on data obtained from National Weather Service and the surface area of the drainage area, using the TR-55 model.

Assess silting and scouring of the surface water conduits

Inspect the existing surface water management structures at the site, including the stormwater diversion berm, 12-inch drainage pipe and headwall, and rip-rap drainage swale. These structures will be assessed for scouring and silting due to stormwater drainage. Determination of the adequacy of the design and construction of these structures will be based on this inspection and the design storm event.

Calculate stormwater flow volumes

Surface water flow volumes will be calculated, based on the 25-year occurrence, 24-hour duration storm event, discussed above. The rainfall event information will be obtained directly from the National Weather Service. Flow volumes will be calculated using appropriate mathematical models such as TR55.

Calculate the capacity of existing surface water management systems

Based on the results of the surface water flow volume calculations and the inspection of the surface water drainage system, the capacity of this system to handle the flow, volume and velocities generated by a 25-year, 24-hour storm event will be evaluated.

Perform TR-55 Modeling

As previously discussed, TR-55 will be used to calculate storm runoff volume, peak rate of discharge, hydrographs, and storage volumes required in designing hydraulic features at this site. The volume of water that will infiltrate a landfill cap equals the total volume that falls on the area landfill cap minus the volume that runs off of the cap. TR-55 is applicable for analyzing surface water runoff of large areas composed of multiple cells, each having different infiltration characteristics.

Stormwater runoff is determined primarily by the amount of precipitation and by infiltration characteristics related to soil type, soil moisture, antecedent rainfall, cover type, impervious surfaces, and surface retention. The model described in TR-55 begins with a rainfall amount uniformly imposed on the landfill cover over a specified time distribution. Mass rainfall is converted to mass runoff by using a runoff curve number (CN). CN is based on soils, plant cover, area of impervious areas, interception, and surface storage. Runoff is then transformed into a hydrograph by using unit hydrograph theory and routing procedures that depend on runoff travel time through segments of the watershed. Runoff from each cell is collected in a reach. Reaches may flow into subsequent reaches or terminate at an outlet point The ability of each component of the current surface-water drainage system to handle reach-specific flows will be evaluated to ensure that current and future drainage system components are appropriately sized for the anticipated flow velocities and discharges.

5.2.4 Evaluate Potential for Explosive Gas Generation and Migration

The existing landfill will be evaluated to determine whether it minimizes formation and release of explosive gas to the atmosphere to the extent necessary to protect human health and the environment. Landfill gas monitoring was performed by BFIO from 1989 through 1994. The results of this monitoring indicated no measurable explosive gas. These monitoring data will be used as a portion of a weight-of-evidence argument to evaluate this concern and pathway. In addition, during site inspection activities, any observations that would indicate substantial landfill gas generation (e.g., the presence of gas vent hole through the cover materials) will be documented and included in the evaluation. This evaluation will include a perimeter survey of ambient air for VOCs using a PID and the screening of each boring for landfill/explosive gases.

5.2.5 Evaluate Erosion and Flood Protection

To determine predicted erosion rates for the landfill, the potential for flooding will be evaluated. This evaluation will include assessment of Black River flood elevations and velocities to determine whether the landfill extends below flood elevation and is subject to erosion. This evaluation will include the following activities:

- Survey topography of landfill surface, slopes and Black River floodplain;
- Predict the erosion rate using *Revised Universal Soil Loss Equation*;
- Determine the local flood elevation from Flood Insurance Rate Map (from FEMA);

- Determine flood velocities; and

- If the landfill or portion of the landfill is situated at an elevation below the flood elevation, potential impacts of flooding will then be assessed.

5.3 Further Evaluate Soil, Groundwater, Surface Water and Sediment Pathways

5.3.1 Evaluate Current Soil Conditions

As detailed in Section 5.2.1 above, a total of 12 surface soil samples and 12 subsurface soil samples will be collected and analyzed for COPCs. These data will facilitate the evaluation of the direct contact pathway of concern. The surface soil samples will be collected from the 0 to 2 foot interval, and the subsurface soil samples will be collected from the 4 to 6 foot interval or the 2 foot interval immediately above the base of the cover materials in the event either waste materials or bedrock is encountered prior to reaching a depth of 6 feet. Sampling locations will be determined in the field and will be biased towards areas where exposed waste is observed. It is anticipated that the sampling locations will include four locations on the south slope, three locations on the east slope, three locations on the north slope and two locations near the western boundary.

In addition, a total of five surface and five subsurface background soil samples will be obtained from locations in the site vicinity which have not been impacted by the landfill operations.

Soil samples selected for analysis in connection with this task will be appropriately collected and analyzed for potential chemicals of concern, as listed in Table 5.3.

5.3.2 Evaluate Current Groundwater Use

In order to determine whether groundwater in the vicinity of the site is utilized as a drinking water source, current groundwater use will be evaluated to determine whether residents use groundwater (potable and non-potable uses) or City Water (from surface water source). This evaluation will consist of four tasks that are designed to definitively determine current groundwater users. These tasks include:

- Define a search radius and obtain list of addresses within that radius;
- Search Ohio Department of Natural Resources (ODNR) water well logs within one-mile radius of site;
- Search water use records (City Water) for residents within one-mile radius of site; and
- Identify residents, if any, who are not connected to City Water.

5.3.2.1 Search Radius Definition and Address List

Based on site features, site location, presence of the site near a natural groundwater flow boundary and other information, the area to be evaluated for current groundwater use will include the area one-mile in radius from the landfill. This will be the area in which the ODNR water well search and other records searches will be completed. Based on this radius, either a site reconnaissance survey or governmental record survey (tax survey, etc.) will be completed to obtain addresses of all residences within this area. These addresses will be maintained in an electronic file and will be the basis of the search activities included below.

5.3.2.2 Ohio DNR Water Well Log Search

A search of water well logs filed with the ODNR (Columbus, Ohio) will be completed. ODNR well logs and a map showing the well locations will be obtained for the study area.

After the results of the search are obtained, wells located within the search area will be field located. ODNR potable water well logs do not always contain addresses of the well location, though maps and other information (owner names, etc) are included. Therefore, locations of the wells will be ascertained by a "site reconnaissance survey". That is, the maps and information included on the well logs will be used to tentatively identify the locations of the wells.

5.3.2.3 City Water Use Record Search

A request for a list of City of Elyria water department customers will be made. This list, which will be requested as an electronic file, will include service addresses and/or billing addresses for all water department customers.

5.3.2.4 Identification of Potential Groundwater Users

After the above information is obtained, the city water use records will be compared against the potable water well records. Addresses that have only city water records will be defined as having no current groundwater use and no further evaluation of current groundwater use will be made for these addresses. Addresses that have only potable water well records or those addresses that have city water use records and potable water well records will be identified for additional evaluation. This evaluation may, based on the location, direction, and potential for impact from the site, consist of other means to determine if potable water well is actually in use or has been abandoned or removed. These additional activities will be defined based on identification of these addresses.

5.3.3 Evaluate Potential for Future Groundwater Use

In order to evaluate the potential for future groundwater use at the site and in the vicinity of the site, research will be conducted on the property deeds for the site and site vicinity to determine whether there are any restrictions of groundwater use. Research on local ordinances will also be completed to determine if any groundwater restrictions exist. Based on the results of this evaluation, the potential for the application of institutional controls (e.g., deed restrictions, municipal ordinance) will also be explored as methods to prevent potential for future exposure associated with potable use of groundwater.

5.3.4 Assess Current Groundwater Quality

In order to assess current groundwater quality at the facility, a direct-push groundwater quality survey will be performed and a groundwater monitoring network will be installed, surveyed, and periodically monitored and sampled. Existing groundwater monitoring wells of questionable construction will be properly sealed. Activities to be conducted are discussed in greater detail below.

5.3.4.1 Seal Existing Monitoring Wells

Recent site visits (15 October and November 14, 2001) discovered that the three existing groundwater monitor wells have no surface seals evident along the outer steel protective casings. The inner PVC well casings and compression caps were muddy from flooding that had apparently occurred. In addition, one of the three wells appears to have been damaged. Because the quality of groundwater data from existing wells in this condition would be suspect, the existing wells will be properly abandoned by sealing as detailed below.

- Abandon, by sealing, each of the three existing monitor wells that were installed between landfill and Black River. MW-1 was installed at boring FRL-4 or B-4 approximately 12.7 feet deep; MW-2 was installed at boring FRL-3 or B-3 approximately 12.7 feet deep; MW-3 was installed at boring FRL-2 or B-2 approximately 20.7 feet deep. (No monitor well was installed at upgradient boring FRL-1 or B-1.)

- Abandon wells, by sealing, in accordance with *Technical Guidance for Sealing Unused Wells*, State Coordinating Committee on Ground Water, 1996 and consistent with ASTM D5299-99.

- Submit to Ohio DNR the Water Well Sealing Report for each abandoned well.

5.3.4.2 Direct-Push Groundwater Quality Screening & Monitoring Well Installation

Prior to the initiation of the monitoring well installation activities, a total of four boreholes will be advanced using direct-push methods for the purpose of collecting groundwater samples to screen groundwater quality along the downgradient edge of the landfill. The direct-push boreholes shall be advanced at two locations equally spaced between the three proposed downgradient well locations and at two locations flanking the northern most and southern most downgradient well locations. At each of these boreholes, groundwater samples will be obtained at 5-foot vertical intervals from the water table to the top of bedrock.

Data for evaluation of groundwater quality upgradient and downgradient of the landfill will be collected from six new monitoring wells that will be installed.

One upgradient monitoring well will be installed to a depth appropriate to monitor the first water bearing zone. This well is anticipated to be installed in the shallow bedrock, given the historical observation that groundwater was not encountered within the overburden in this vicinity. One side gradient monitoring well will be installed to the southwest of the landfill to access background conditions within the saturated overburden at a location likely to be unimpacted by the site. Three downgradient overburden monitoring wells (estimated 15 feet to 20 feet deep along the landfill toe), will be installed to characterize groundwater quality immediately downgradient of the landfill. In addition, one shallow bedrock monitoring well will be installed in a cluster with the centrally located downgradient overburden well to assess the potential for groundwater quality in the bedrock downgradient of the site. The locations of each of these proposed wells are shown on Figure 2. The actual placement of these wells was determined based on review of existing monitoring well locations and data obtained from these locations. The upgradient well will be installed west of Ford Road. Both the upgradient and the side gradient wells will be installed in areas where no landfilling or waste disposal operations had occurred. The three downgradient wells and the downgradient bedrock well will be placed as close as feasible to the landfill toe, without causing damage to the existing cover or landfill slopes in these areas. One downgradient well will be placed on the northeast corner of the site, which appears to correlate to the most downgradient area of the site. Further, two additional downgradient wells will be installed somewhat south of this well, in other downgradient areas. After installation, a licensed surveyor will survey the horizontal location, top-of-casing and ground elevation of all monitoring wells. Procedures for the well development are presented in Appendix 14 of the QAPP.

Monitoring well locations, as shown on Figure 2 were chosen in order to allow for:

- Determination of the groundwater surface elevation in this area;
- Determination of groundwater quality (presence, extent and magnitude of chemicals of concern);
- Determination of the impact of the landfilling operations to downgradient groundwater quality; and
- Collection of data to support risk assessment, feasibility study and remedial alternative selection.

In addition to the groundwater data that will be collected, monitoring well installation will also allow for the collection of data for the characterization of the subsurface soils. This characterization will be completed through the continuous sampling and logging of the boreholes during advancement. Each soil sample collected will be described, characterized, and identified by the on-site geologist. Further, screening for organic vapors will be completed by methods described in the QAPP. This data will be used to obtain information on subsurface soils throughout the site area. Information obtained will be used for 1) selection of remedial alternatives, 2) determination of presence, extent and magnitude of chemicals of concern, and 3) collection of data to support risk assessment, feasibility study and remedial alternative selection.

5.3.4.3 Groundwater Monitoring

In order to determine the seasonal groundwater surface, to define changes in groundwater flow patterns throughout the year, and to define downgradient receptors (if any), bi-monthly (once every other month) groundwater elevations will be measured. As a part of this monitoring, the depth to groundwater in each monitoring well will be measured, along with the depth to the bottom of each well. This data will then be used, along with monitoring well survey data (described above), to calculate the groundwater elevation in each well and to plot groundwater surface maps.

5.3.4.4 Groundwater Sampling

In order to characterize site groundwater quality and determine whether surface water is being impacted by site groundwater, two rounds of groundwater sampling will be completed. Groundwater samples from each new monitoring well will be appropriately collected and analyzed for potential chemicals of concern, as listed in Table 5.3. Groundwater sampling will be completed during both seasonally high and seasonally low water conditions, to define groundwater conditions at each time. Based on regional historical conditions, it is assumed that seasonal highs will exist in the spring (e.g., April/May) and seasonal low conditions will exist in the fall (September/October). Should the results of these two rounds of sampling indicate substantial seasonal variability, the need for additional sampling events would be considered.

5.3.5 Leachate Seep Observation

every 6 wks

In order to evaluate the leaching to surface water pathway and to confirm the recent observations regarding the leachate seeps reported to have been observed along the north slope of the landfill at the site, the site will be periodically inspected for the presence of seeps. Site visits will be conducted on a bi-monthly basis (every other month) over a 12-month period during which detailed inspections will be performed. Observations of the site conditions made during these inspections will be used to document leachate seeps throughout a range of seasonal conditions. Field activities during these site visits will include: 1) select brush clearing, as needed, in densely vegetated areas along the toe of the slope; 2) inspection of the landfill slope area where former leachate seeps were reported; 3) inspection of the remainder of the slope, 4) photographing the slope areas, and 5) documenting the inspection findings in a field log book. Results of these inspections will be provided to the USEPA and OEPA in the monthly progress reports, as well as in the final RI/FS report. If leachate seeps are encountered, the USEPA and OEPA will be contacted and leachate sampling will be conducted.

5.3.6 Surface Water and Sediment Sampling

The results of previous investigations indicate that there are no Site-related constituents of potential concern discharging into the Black River at concentrations which would represent a risk to either human health or the environment. Two surface water sampling events will be conducted to confirm the previous investigation results. The two sampling events will be conducted during periods of relatively high flow and low flow conditions. Ten grab samples of surface water will be collected during each event for laboratory analysis from the locations in the Black River indicated on Figure 2. The proposed locations have been selected to be adequately biased toward areas most likely to be impacted by potential for discharge from the site. Each water sample will be a composite of samples collected at 20 and 80 percent depth. Field observations of temperature, dissolved oxygen, conductivity, pH, water depth, and flow velocity will be recorded at each sample location.

A grab sample of sediment will also be collected for laboratory analysis from the same locations where water samples are collected from the Black River. An appropriate sampling device that captures sediments from the biologically active zone (e.g., a Ponar or Eckman-type sampler) will be used to collect a sufficient volume of materials for chemical analyses.

5.4 Analytical Program

Samples of groundwater, surface and subsurface soil, sediment and surface water will be analyzed for potential chemicals of concern as listed in Table 5.3 using the analytical methods presented in Section 11.3 of the QAPP.

TABLE 5.3
POTENTIAL CHEMICALS OF CONCERN AND ANALYTICAL PLAN

Matrix	Chemicals of Concern	Analytical Method
Groundwater	Volatile organic compounds	TCL by CLP OLM04.2
	Semi-volatile organic compounds	TCL by CLP OLM04.2
	Pesticide / PCBs	TCL by CLP OLM04.2
	Metals (Total and Dissolved)	TAL by CLP ILM04.1
	pH, Specific Conductivity, Temperature	Field Analysis – Field Instrumentation
	Dissolved oxygen	Field Analysis – Field Instrumentation
	Turbidity	Field Analysis – Field Instrumentation
	Sulfate, Ferrous Iron, Nitrate	Field Analysis – Hach Test Kits
Surface Water	Volatile organic compounds	TCL by CLP OLM04.2
	Semi-volatile organic compounds	TCL by CLP OLM04.2
	Pesticide / PCBs	TCL by CLP OLM04.2
	Metals (Total and Dissolved)	TAL by CLP ILM04.1
	pH, Specific Conductivity, Temperature	Field Analysis – Field Instrumentation
Stream Sediment, Surface Soil & Subsurface Soil	Volatile organic compounds	TCL by CLP OLM04.2
	Semi-volatile organic compounds	TCL by CLP OLM04.2
	Pesticide / PCBs	TCL by CLP OLM04.2
	Metals	TAL by CLP ILM04.1

6. Screening-Level Risk Assessment

6.1 General Approach

A screening-level human health evaluation (HHE) and ecological risk assessment (ERA) will be conducted for the Ford Road Site. The general approach for the HHE and the ERA will be to conduct Tier I screening-level evaluations that are focused on the media and exposure scenarios that are most important from a risk perspective. The approach used in the HHE and ERA will be a tiered approach in general accordance with USEPA guidance, and will rely on Tier I screening-level evaluations to identify media and exposure pathways that may pose unacceptable risks (see Figure 3). More detailed (Tier II) risk assessments will be conducted only if the Tier I screening-level evaluations identify potentially significant risks.

6.2 Human Health Risk Evaluation

A screening-level HHE will be conducted for the Ford Road Site to evaluate potential human health risks associated with exposure to Site-related constituents. This Tier I screening-level HHE will be performed in accordance with current USEPA guidelines including (as appropriate):

- Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment (USEPA, 2001).
- Exposure Factors Handbook (USEPA, 1997b).
- Guidelines for Carcinogen Risk Assessment (USEPA, 1996).
- Guidance for Data Usability in Risk Assessment (USEPA, 1992b).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" (USEPA, 1991a).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual. Part A (USEPA, 1989a).

The screening-level HHE will consist of the following four steps: 1) data evaluation; 2) exposure assessment; 3) toxicity assessment; and 4) risk characterization. These four steps are described below.

Step 1: Human Health Data Evaluation

The data evaluation section will summarize the available data (including historic data collected by PRC and others, and data that will be collected by BBL as part of the RI), and identify preliminary human health constituents of potential concern (HCOPCs) for groundwater, soil, sediment and surface water. Preliminary HCOPC will be identified from an initial screening with background concentrations, frequency of detection, and preliminary screening values. Background concentrations for use in the preliminary screening will be developed based on two times the average of the Site-specific background data. Preliminary screening values will include conservative human health risk-based values, such as Region 9 Residential Preliminary Remediation Goals (PRGs) for soil and water and similar values, as appropriate. Media that do not exhibit any preliminary HCOPCs will not be evaluated further.

Step 2: Human Health Exposure Assessment

The exposure assessment identifies potential receptors and pathways of exposure to Site-related constituents. This process involves consideration of constituent concentrations in various media (e.g., soil, surface water, sediment, and groundwater), land use, and potentially-exposed receptor populations and their activity patterns. A preliminary conceptual site model for human health is included as Figure 4. Currently, the landfill is accessible and serves no public recreational use. In terms of future land use, the property may be included as part of an environmental greenspace, and will likely be left in a natural or semi-natural condition. Regardless, future residential use of the Site is unlikely. Under these land use scenarios, current receptors are most likely trespassers and occasional maintenance workers. Potential future receptors may include recreational users engaged in outdoor activities such as hiking or bird watching. For these receptors, incidental ingestion, dermal contact, and/or inhalation exposure pathways will be considered for on-site soils. Potential exposure to surface water and sediment from the Black River may also be evaluated. Exposure to groundwater may be evaluated, pending additional information on potential groundwater use in the vicinity of the Site. Media for which there are no viable exposure pathways will be dropped from further evaluation.

Step 3: Human Health Toxicity Assessment

For the Tier I screening-level HHE, the toxicity assessment will include the identification of screening-level risk based concentrations (RBCs). The screening-level RBCs will address the exposure pathways identified in Step 2 above. The RBCs will be based on the receptors and exposure pathways identified in the exposure assessment (Step 3). The values for the exposure parameters that will be used to develop the RBCs will include standard reasonable maximum exposure (RME) default values from USEPA (1989a, 1989b, 1991a, 1997b) guidance and Site-specific values, as appropriate. The specific exposure assumptions to be used will be provided to the agency for concurrence prior to proceeding with risk calculations. Target risk levels used for the calculation of RBCs will include a hazard quotient of 0.1 for non-carcinogens, and a range of incremental cancer risk of one-in-one million (1×10^{-6}) for carcinogens. Values may also be adjusted (as appropriate) to account for multiple chemicals and/or multiple exposure pathways. The RBCs will be calculated using slope factors (SFs) and reference doses (RFDs) from the USEPA Integrated Risk Information System (IRIS) on-line database and other sources as appropriate.

Step 4: Human Health Risk Characterization

The Tier I screening-level HHE risk characterization will integrate the results of the data evaluation, toxicity assessment, and exposure assessment to evaluate potential risks associated with exposure to Site-related constituents. The screening-level risk characterization will be based on the comparison of Site data to the Site-specific RBCs. The risk characterization will indicate which areas (if any) have concentrations that exceed the RBCs and the extent of the exceedence. These areas will be identified as requiring further investigation in a Site-specific baseline (i.e., Tier II) risk assessment and/or development of remedial action objectives (RAOs).

6.3 Evaluation of Potential Ecological Risk

A screening-level ERA will be completed as part of the RI for the Ford Road Site. The objective of the screening-level ERA will be to provide a preliminary, conservative evaluation of potential ecological risks and determine if any further ecological risk evaluation is necessary. The screening-level ERA will be consistent with agency guidance on ecological risk assessment, including the following:

- USEPA Region 5 Ecological Risk Assessment Guidance (USEPA, 2002d).
- Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites (USEPA, 1999).
- Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997a).
- Framework for Ecological Risk Assessment (USEPA, 1992a).
- Risk Assessment Guidance for Superfund. Volume II: Environmental Evaluation Manual (USEPA, 1989b).
- Final Guidelines for Ecological Risk Assessment (USEPA, 1998).
- Eco Updates. A series of technical guidance on specific components of the ecological risk assessment process. 1991 – 2001 (USEPA, 2002b).
- Ohio EPA DERR Guidance for Conducting Ecological Risk Assessments (Ohio EPA, 2003).

It is important to note that screening-level ERAs rely on non-Site-specific screening criteria to evaluate potential risks. These criteria are highly conservative, as indicated by the frequency at which background concentrations typically exceed the criteria. As indicated by USEPA (2001), "screening-level ERAs are not designed nor intended to provide definitive estimates of actual risk, generate cleanup goals and, in general, are not based on Site-specific assumptions. Rather, the purpose of the screening-level ERA is to assess the need, and if required, the level of effort necessary, to conduct a detailed or baseline ecological risk assessment for the facility." Under no circumstances does a screening-level assessment based on generic assumptions instead of Site-specific data warrant remedial action decisions.

The screening-level ERA for the Ford Road Site will include steps similar to the HHE: 1) data evaluation; 2) exposure assessment; 3) toxicity assessment; and 4) risk characterization. These four steps are described below.

Step 1: Ecological Data Evaluation

The data evaluation for the screening-level ERA will describe the data used in the ERA, and will identify preliminary chemicals of interest for soil, sediment, and surface water. Preliminary ecological constituents of potential concern (ECOPCs) will be identified based on frequency of detection, comparison to background (two times the average site-specific background concentration), and preliminary screening values. The preliminary screening values for identifying ECOPCs will be the USEPA Region 5 Ecological Data Quality Levels (EDQLs). The EDQLs are initial screening levels that can be used to help focus the investigation on those areas and chemicals that are most likely to pose an unacceptable risk to the environment (USEPA, 2002c). Other screening values that may be considered include the Ohio EPA water quality standards and sediment reference values. Specifically, those constituents detected in Site media above the EDQLs and other screening values will be considered preliminary ECOPCs. Media that do not exhibit any chemicals of interest will not be evaluated further.

Step 2: Ecological Exposure Assessment

The second step of the screening-level ERA will be the screening-level exposure assessment, which will include the identification of potential receptors and pathways. This information will be based on a Site visit and habitat characterization. This step will also include a review of information on threatened and endangered animal species and critical/sensitive habitats from the U.S. Fish and Wildlife Service (USFWS) and OEPA. The exposure assessment will conclude with the generation of a conceptual model, which will identify ecological receptors and potentially-complete exposure pathways at the Site.

<u>Habitat Survey</u> - Biologists will perform a Site visit to characterize ecological habitats associated with the Site. The habitat survey will focus on the identification and classification of suitable habitat (i.e., habitats capable of supporting animal populations). A covertype map depicting ecological communities will be generated as part of the habitat survey. If areas of the Site do not contain suitable habitat, it will be concluded that there is no potential for exposure of ecological receptors, and no further evaluation of these areas will be conducted.

Conceptual Model – A preliminary conceptual site model has been developed for the ERA. This conceptual model will be refined (based on Site-specific data) to determine which ecological receptors are potentially exposed to Site-related constituents. This model will incorporate information gained from the habitat survey and data evaluation, and will summarize the environmental setting of the Site, potential chemicals of interest, and potentially complete exposure pathways.

Step 3: Ecological Toxicity Assessment

The third step of the screening-level ERA will be the screening-level toxicity assessment, which will identify ecological screening criteria for the constituents of interest for each medium as determined in the data evaluation. Screening criteria will be identified from the available literature, and may include the USEPA (2000) ecological soil screening levels, USEPA Region 4 (2002c) ecological screening values (USEPA, 2002c) ambient water quality criteria, and other values, as appropriate. It is important to note that these screening criteria are typically conservative and do not necessarily provide a quantitative estimate of risk, and should not be used as remediation levels.

Step 4: Ecological Risk Characterization

The fourth step of the ERA will be the comparison of detected concentrations in soil, sediment, and surface water to the criteria identified in the toxicity assessment. The risk characterization will provide a preliminary estimate of risk, noting that the exceedence of screening criteria (if any) is not necessarily indicative of significant ecological risk. Rather, the Tier I screening-level ERA will determine what additional steps may be appropriate. Additional data collection, if appropriate, may include fish and/or benthic macroinvertebrate surveys (i.e., biocriteria calculations) and/or more Site-specific baseline (i.e., Tier II) ecological risk assessment. Similarly, if bioaccumulative ECOPCs are identified at elevated levels, then additional exposure pathways (e.g., ingestion of fish) will be evaluated.

7. Feasibility Study

7.1 General

In the event that the baseline risk assessments identify an unacceptable risk associated with one or more COPCs, a Feasibility Study (FS) will be implemented. The scope of the FS, if required, would be limited to addressing the specific constituents, pathways and media identified to be of concern. The FS would include the following components:

- Consideration of Applicable or Relevant and Appropriate Requirements (ARARs);

- Establishment of appropriate Remedial Action Objectives (RAOs) which present media-specific goals for protecting human health and the environment;

- Development and screening of alternatives capable of achieving the RAOs; and

- Detailed analysis of potentially applicable alternatives, including No Action.

The appropriateness and benefits of utilizing a presumptive remedy approach at this Site will be evaluated based on the results of the Remedial Investigation and baseline risk assessments. Should the use of a presumptive remedy be found to be appropriate for this Site, the FS process would be modified as needed.

The FS process will be initiated following the receipt of the results for the RI. The overall objective of the FS is to identify and evaluate remedial action alternatives that are appropriate for Site-specific conditions and the protection of human health and the environment. The FS process will be conducted in accordance with the following:

- The USEPA document entitled, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, dated October 1988; and

- Applicable provisions of the NCP regulations contained in 40 CFR Part 300.

The FS process will, in general, consist of completing the following four subtasks:

- Identification and Preliminary Screening of Remedial Methods;
- Development and Assembly of Remedial Action Alternatives;

- Evaluation of Remedial Action Alternatives; and
- Preparation of FS Report.

A detailed description of work activities to be completed for each subtask is presented below.

7.2 Identification and Preliminary Screening of Remedial Methods

Under this subtask, the framework for the FS will be established by identifying remedial action objectives (RAOs) for the Site. The RAOs will be used as a basis for determining the anticipated effectiveness of each remedial technology and remedial action alternative. RAOs will be formulated based on the results of the RI and Standards Criteria and Goals (SCGs) that are identified for the Site. Potential SCGs are described below:

- Standards and Criteria: These are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or Ohio law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance.

- Guidelines: *These are non-promulgated criteria and guidance that are not legal requirements.* However, the remedial plan for the Site should be designed with consideration given to guidelines that, based on professional judgment, are determined to be applicable to the Site.

SCGs will be progressively identified and applied on a Site-specific basis as the RI/FS progresses. Potential SCGs will be identified for the Site and will be categorized into the following classifications:

- Chemical-Specific SCGs: These SCGs are usually health- or risk-based numerical values or methodologies which, when applied to Site-specific conditions, result in the establishment of numerical values for each chemical constituent of interest. These values establish the acceptable concentrations of a particular chemical constituent which may be discharged to the environment.

- Location-Specific SCGs: These SCGs are restrictions placed on the concentration of hazardous substances or the conduct of activities based solely on their location within the environment.

- Action-Specific SCGs: These SCGs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous waste management and Site cleanup. For example, potential remedial actions would have to consider compliance with the National Historic Preservation Act, should it be determined to be applicable.

The RAOs established will be forwarded to the USEPA to obtain concurrence prior to completing the FS. Upon USEPA concurrence, remedial technologies will be identified which are potentially acceptable for addressing impacted media (i.e., soil, ground-water, and/or sediment) at the Site. The identification of remedial technologies will involve a focused review of available literature, including the following USEPA documents:

- Treatment Technologies (USEPA, 1991b);
- Presumptive Remedies Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils (USEPA, 1993a); and
- Superfund Innovative Technology Evaluation Program Documents/Literature (USEPA, various dates).

These documents, along with remedial technology vendor information and other literature sources, will be reviewed to identify remedial technologies that are potentially applicable for cost effectively addressing the chemical constituents of interest at the Site and for meeting the RAOs.

The potential remedial technologies identified for the Site will be technically described (briefly), subjected to a preliminary screening, and either eliminated or retained based on the following criteria:

- Effectiveness - This screening criteria refers to the ability of the remedial technology to reduce the toxicity, mobility, and/or volume of a particular chemical constituent, and the ability to provide protection of human heath and the environment.
- Implementability - This screening criteria refers to the ability to construct and reliably operate the remedial technology (technical feasibility) until the remedial action is complete.

Based on the results of the preliminary screening, remedial technologies will be eliminated or retained and subsequently combined into remedial action alternatives which will be further evaluated in a detailed analysis of remedial action alternatives. The reasons for excluding or retaining each remedial technology will be discussed in the FS Report.

7.3 Development and Assembly of Remedial Action Alternatives

The retained potential remedial methods will be combined, as appropriate, to form comprehensive remedial action alternatives capable of addressing the impacted environmental media at the Site. In accordance with the NCP as contained in 40CFR Part 300, the following range of remedial action alternatives will be developed to the extent possible:

- The no-action alternative;

- Alternatives that remove chemical constituents of interest to the maximum extent possible, thereby eliminating or minimizing the need for long-term management;

- Alternatives that treat the chemical constituents of interest, but vary in the degree of treatment employed and the extent of long-term management that is required; and

- Alternatives that involve little or no treatment but provide protection of human health and the environment by reducing, minimizing, or preventing exposure to the chemical constituents of interest through the use of containment options and/or institutional controls.

It is anticipated that the remedial action alternatives will be assembled and proposed for further evaluation in the detailed analysis of remedial action alternatives.

7.4 Evaluation of Remedial Action Alternatives

Each of the remedial action alternatives will be described in detail and will be evaluated with respect to the nine NCP criteria. These criteria encompass statutory requirements and include other gauges of the overall feasibility and acceptability of the remedial action alternatives. The NCP criteria include the following:

- Compliance with SCGs (ARARs);
- Overall Protection of Human Health and the Environment;
- Short-Term Effectiveness;
- Long-Term Effectiveness and Permanence;
- Reduction of Toxicity, Mobility, or Volume through Treatment;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

A discussion of each of these criteria is presented below.

Compliance with SCGs

This criterion evaluates the compliance of the remedial action alternatives with the SCGs. The evaluation will be based on compliance with the following:

- Chemical-specific SCGs;
- Location-specific SCGs; and
- Action-specific SCGs.

This evaluation criterion also addresses whether or not the remedial alternative would be in compliance with other appropriate federal, and/or state criteria, advisories, and guidance.

Overall Protection of Human Health and the Environment

This criterion evaluates whether the remedial alternative provides adequate protection of human health and the environment. This evaluation relies on the assessment of other evaluation criteria, including long-term and short-term effectiveness and compliance with SCGs.

Short-Term Effectiveness

The short-term effectiveness of the remedial action alternative will be evaluated relative to its effect on human health and the environment during implementation of the alternative. The evaluation of each remedial action alternative with respect to its short-term effectiveness will consider the following:

- Short-term impacts to which the community may be exposed during implementation of the alternative;

- Potential impacts to workers during implementation of the remedial action alternatives and the effectiveness and reliability of protective measures;

- Potential environmental impacts of the remedial action alternative and the effectiveness of mitigative measures to be used during implementation; and

- Amount of time before environmental concern is mitigated.

Long-Term Effectiveness and Permanence

The evaluation of each remedial action alternative relative to its long term effectiveness and permanence will be made by considering the risks that may remain following implementation of the alternative. The following factors will be assessed to evaluate the alternatives long-term effectiveness and permanence:

- Potential environmental impacts from untreated waste or treatment residuals remaining at the completion of the remedial action alternative;

- The adequacy and reliability of controls (if any) that will be used to manage treatment residuals or untreated waste remaining after the completion of the remedial action alternative; and

- The ability of the remedial action alternative to meet the RAOs established for the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion evaluates the degree to which remedial actions will permanently and significantly reduce the toxicity, mobility, or volume of the chemical constituents present in the Site media. The evaluation will be based on the following:

- The treatment process and the volume of the materials to be treated;

- The treatment process ability to reduce the toxicity, mobility, or volume of the chemical constituents of interest;

- The nature and quantity of residuals that will remain following treatment;

- The relative amount of hazardous substances and/or chemical constituents that will be destroyed, treated, or recycled; and

- The degree to which the treatment is irreversible.

Implementability

This criterion addresses the technical and administrative feasibility of implementing the remedial alternative, including the availability of the various services and materials required for implementation. The evaluation of implementability will be based on the following:

- Technical Feasibility - This refers to the relative ease of implementing the remedial alternative based on Site-specific constraints. In addition, the ease of construction, operational reliability, and the ability to monitor the effectiveness of the remedial alternative are considered.

- Administrative Feasibility - This refers to the feasibility/time required for acquiring the necessary permits and approvals to implement the remedial alternative.

Cost

This criterion evaluates the estimated total cost to implement the remedial alternative. The total cost of each alternative represents the sum of the direct capital costs (materials, equipment, and labor), indirect capital costs (engineering, licenses/permits, and contingency allowances), and operation and maintenance (O&M) costs. O&M may include operating labor, energy, chemicals, and sampling and analysis. These costs will be estimated with an anticipated accuracy between -30 and +50% in accordance with the USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. A contingency factor will be included to cover unforeseen costs incurred during the implementation of the remedial action alternative. Present-worth costs will be calculated for alternatives expected to last more than two years. In accordance with USEPA guidance presented in OSWER Directive 9355-3-20, a 7% discount rate (before taxes and after inflation) will be used to determine the present-worth factor.

State Acceptance

This criterion evaluates the state's (support agency's) apparent preferences among or concerns about alternatives.

Community Acceptance

This criterion evaluates the community's apparent preferences among or concerns about alternatives.

A summary of the information generated by the evaluation of each remedial action alternative using the nine criteria previously defined will be presented in the FS Report as discussed below.

7.5 Preparation of FS Report

A FS Report will summarize the information developed during the FS process as described above. In accordance with USEPA guidance documents, a comparative analysis of each remedial action alternative for addressing impacted media at the Site using the seven evaluation criteria discussed above will be conducted. The purpose of the comparative analysis will be to identify the relative advantages/disadvantages of each remedial action alternative and to highlight the differences between the alternatives. The results of the comparative analysis will be presented in the FS Report and will be used as the basis for recommending a remedial alternative for addressing impacted media at the Site. The FS Report will be submitted to the USEPA for review and approval.

8. Project Schedule

A tentative schedule for completing the RI/FS activities presented in this Work Plan is presented on Figure 6. The schedule is subject to change with the approval of USEPA, based on USEPA review and/or unforeseen considerations which may arise during the implementation of the RI/FS work activities.

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Tables

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

TABLE 3-1

SIGNIFICANT FINDINGS OF SEDIMENT AND LEACHATE SAMPLE ANALYSIS
OCTOBER 1980

FORD ROAD LANDFILL SITE
ELYRIA, OHIO

Sample ID: Laboratory Report Date: Units: Sample Type:	80-VF11S01 10/21/1980 μg/kg Sediment	80-VF11S02 10/21/1980 μg/L Leachate
ANALYTE DETECTED		
Dimethylbenzenes	<3	**720**
Ethylbenzene	<3	**260**
3,3,5-Trimethylcyclohexanone	<3	**2,300**
3,3,5-Trimethylcyclohexanol	<3	**700**
1,1'-Oxybisbenzene	<3	**610**
Methylenebisbenzenamines	<3	**3,700**
HC and/or Long Chain Alcohol	**30**	**500**
Bis(2-ethylhexyl)phthalate	**81**	**7,500**
Phenol	**0.3**	<267.2
Methylphenol	**6.6**	<267.2
1H-Indole	**0.5**	<267.2
Tetradecanediols	**4.2**	<267.2
Tetrahydrofuran	--	**336,000**
PCB (Aroclor 1248)	**4**	--
Ammonia	**100**	**2,000**
Lead	**190**	**4.75**
Cadmium	**13**	**0.32**
Zinc	**400**	**7.21**
Barium	**680**	**57.9**
Chromium	**460**	**4.04**
Titanium	**58**	**1.31**
Boron	**150**	**57.9**

Notes:
Numbers in boldface represent significant findings.
-- = No information available for associated analyte.

TABLE 3-2

SIGNIFICANT FINDINGS OF GROUNDWATER SAMPLE ANALYSIS
JULY 1983

FORD ROAD LANDFILL SITE
ELYRIA, OHIO

Sample ID:	E3831	E3832	E3833	E3834
Date:	7/19/1983	7/19/1983	7/19/1983	7/19/1983
Units:	ug/L	ug/L	ug/L	ug/L
Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater
ANALYTE DETECTED				
Methylene Chloride	5 U	5 U	**2,978**	5 U
Acetone	**1,952**	**1,089**	5 U	5 U
Alpha-BHC	**12.3**	**4.4**	0.005 U	0.005 U

Notes:

Numbers in boldface represent significant findings.

All concentrations are in micrograms per liter (Fg/L).

General Qualifiers:

U = The compound or analyte was analyzed for but not detected. Associated value is the sample quantitation limit (SQL).

TABLE 3-3

SIGNIFICANT FINDINGS OF SOIL AND SEDIMENT SAMPLE ANALYSES
MAY 18, 1993

FORD ROAD LANDFILL SITE
ELYRIA, OHIO

Sampling Location / Date / Time		SD-07 05/18/93 2005	SD-01 05/18/93 1425	SD-05 05/18/93 1715	SD-02 05/18/93 1330	SD-03 05/18/93 1560	SD-04 05/18/93 1640	SD-06 05/18/93 1500	SD-08 05/18/93 1400
Sample Type		Background Int. Stream	Environmental Int. Stream	Background Black River	Environmental Black River	Environmental Black River	Environmental Black River	Environmental Wetland	Environmental Black River
Appearance		Med. Brown	Orange	Med. Brown	Med. Brown	Med. Brown	Med. Brown	Dk. Brown	Orange
VOLATILE ORGANIC COMPOUNDS	**CRQL**								
No significant compounds identified									
SEMIVOLATILE ORGANIC COMPOUNDS	**CRQL**								
No significant compounds identified									
PESTICIDES/PCBs COMPOUNDS	**CRQL**								
delta-BHC	1.7	2.0 U	2.7 U	2.9 U	1.2 JPX?	1.4 JPX?	2.9 U	6.1 U	110 PJ?
alpha-chlordane	1.7	2.0 U	2.7 U	2.9 U	2.1 U	2.6 U	2.9 U	5.4 JPX?	100 PJ?
Aroclor-1254	33.0	38 U	50 J?	56 U	38 PJ?	50 U	56 U	1,100	560 U
ANALYTE DETECTED (mg/kg)	**CRQL**								
arsenic	2	7.5	10.0	8.5	9.1	45.4	6.9	8.8	6.8
barium	40	58.9	91.4	96.3	39.6 B	159	88.8	701	64.7 B
calcium	1,000	1,520	14,800	2,220	3,530	2,570	2,500	66,800	8,610
lead	0.6	14.8*	62.6*	58.2*	27.2*	52.9*	78.5*	298 S*	54.4 S*
manganese	3	195	1,430	153	193	134	126	862	217
nickel	8	21.7	135	40.7	61.1	28.1	44.3	111	112
zinc	4	61.4	196	293	141	290	295	1,120	251

Notes:
Numbers in boldface represent significant findings.
All concentrations are in micrograms per kilogram (μg/kg) unless otherwise noted.
CRQL = Contract-required quantitation limit.
CRDL = Contract-required detection limit.

General Qualifiers:
J = Value is estimated (also indicates a compound that is detected below the CRQL).
? = Analytical bias is unknown.
U = The compound or analyte was analyzed for but not detected. Associated value is the sample quantitation limit (SQL).

Compound Qualifiers:
P = Variance between GC columns was greater than 25% in pesticide or Aroclor (PCB) analytes. The lower value is reported.
X = Reported compound with PCB Aroclor peaks on one or both analytical columns.

Analyte Qualifiers:
B = Value is below the CRDL.
* = Duplicate relative percent difference values were outside of control limits.
S = Analyte concentration was determined by method of Standard Additions (MSA).

TABLE 3-4

SUMMARY OF SURFACE WATER SAMPLE ANALYSES
MAY 18, 1993

FORD ROAD LANDFILL SITE
ELYRIA, OHIO

Sampling Location: Date: Time: Sample Type:		SW-05 05/18/93 1700 Background Black River	SW-02 05/18/93 1320 Environmental Black River	SW-2D 05/18/93 1320 Field Duplicate	SW-B01 05/18/93 800 Field Rinsate Blank	SW-TB 05/18/93 800 Trip Blank
VOLATILE ORGANIC COMPOUNDS	**CRQL**					
methylene chloride	10	2	2 U	2 U	2	1 J?
acetone	10	10 U	9 BUJ?	23 J?	65 BU	140 B
Tentatively Identified Compounds (Total)	N/A	ND	ND	ND	ND	ND
SEMIVOLATILE ORGANIC COMPOUNDS	**CRQL**					
bis-(2-ethylhexyl)phthalate	10	2 BU	6 BU	9 BU	5 BU	--
Tentatively Identified Compounds (Total)	N/A	ND	ND	ND	ND	--
PESTICIDE/PCB COMPOUNDS	**CRQL**					
No Pesticide/PCB compounds detected.						
ANALYTE DETECTED	**CRQL**					
aluminum	200	172	112	98.0 U	98.0 U	--
barium	200	41.5	41.6	41.4	7.0 U	--
cadmium	5	0.5	0.4	0.5	0.2 U	--
calcium	5,000	72,500	71,300	72,600	610 U	--
iron	100	424	344	356	98.0 U	--
lead	3	3	2 U	2	2 U	--
magnesium	5,000	22,400	22,400	22,600	122 U	--
manganese	15	124	105	107	6.0 U	--
sodium	5,000	35,700	38,100	38,200	1,200 U	--

Notes:
All concentrations are in micrograms per liter (μg/L) unless otherwise noted.
CRQL = Contract-required quantitation limit.
CRDL = Contract-required detection limit.
ND = Not detected.
N/A = Not applicable.
-- = Not analyzed.

General Qualifiers:
J = Value is estimated (also indicates a compound that is detected below the CRQL).
? = Analytical bias is unknown.
U = The compound or analyte was analyzed for but not detected. Associated value is the sample quantitation limit (SQL).

Compound Qualifiers:
B = Compound was detected in an associated laboratory blank.

Figures

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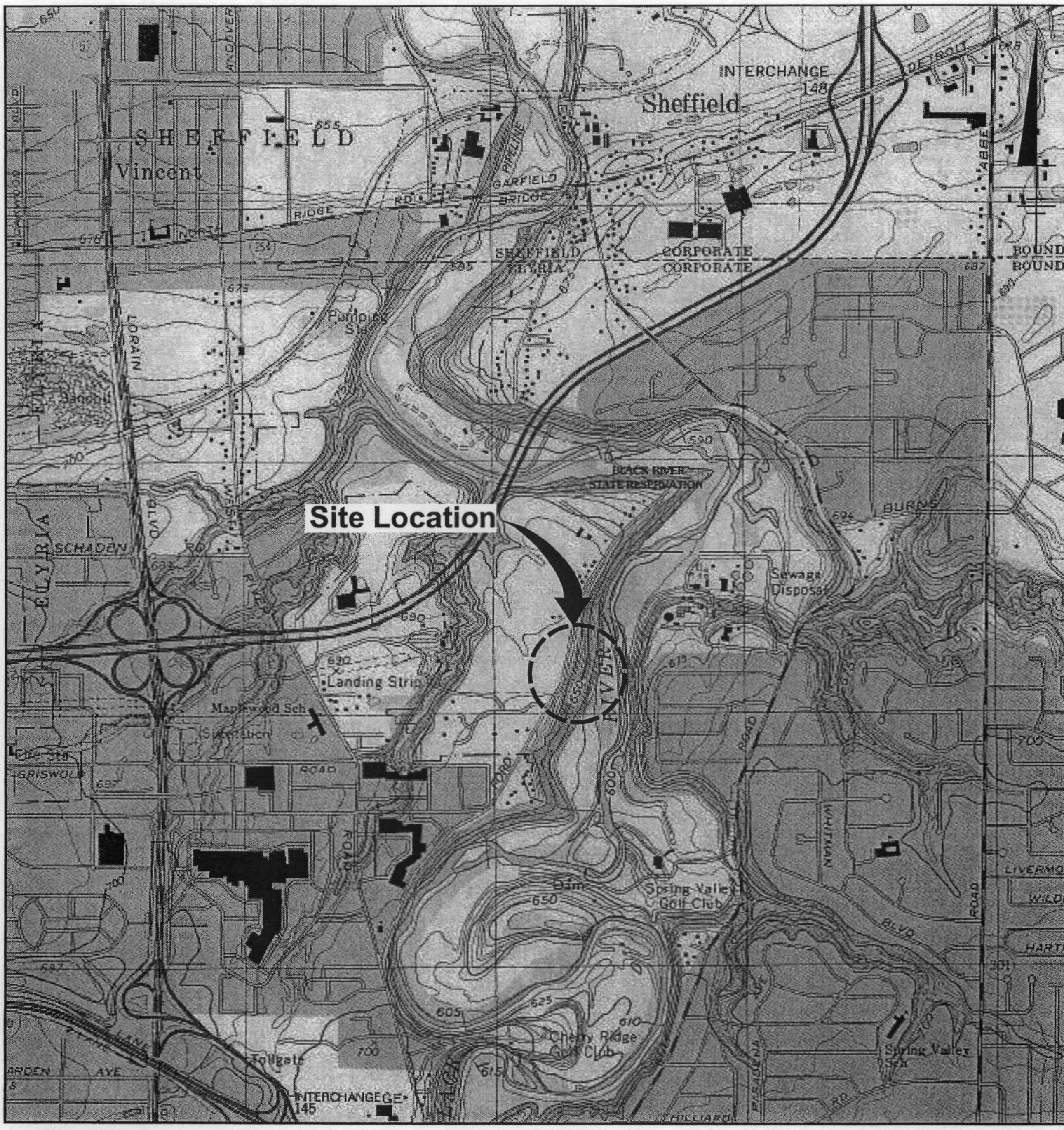
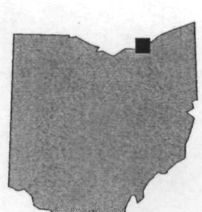


REFERENCE: Base Map USGS 7.5 Min. Quad., Avon, Ohio, 1994.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

FORD ROAD LANDFILL
ELYRIA, OHIO
RI/FS WORK PLAN

SITE LOCATION MAP

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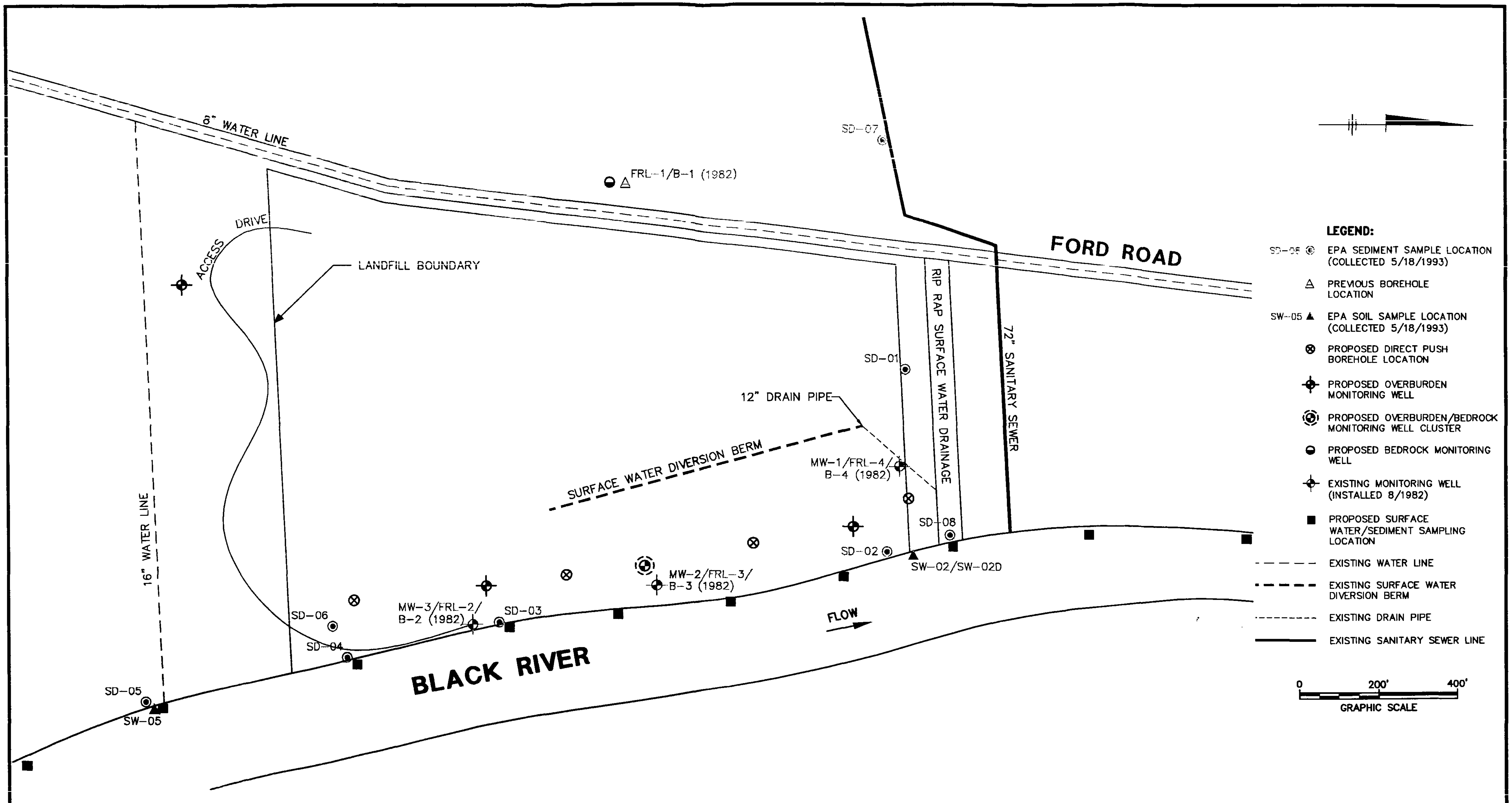
FIGURE
1

02/07/03 SYR-D54-LBR, DJH
42433001/42433n02.cdr



NOTES:

1. Sampling locations are approximate.
2. Location of historic USEPA samples based on plans provided by PRC Environmental Management, Inc. (1994).
3. Landfill boundary based on plan provided by PRC Environmental Management, Inc. (1994).

P: PAGESET/PLT-BL
5/13/03 SYRACUSE-54-RCB
42433001/42074B01.DWG

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UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

FORD ROAD LANDFILL
ELYRIA, OHIO
RI/FS WORK PLAN

SAMPLE LOCATION PLAN

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FIGURE
2

FIGURE 3

FLOW CHART ILLUSTRATING THE TIERED RISK ASSESSMENT APPROACH

FORD ROAD LANDFILL SITE
ELYRIA, OHIO

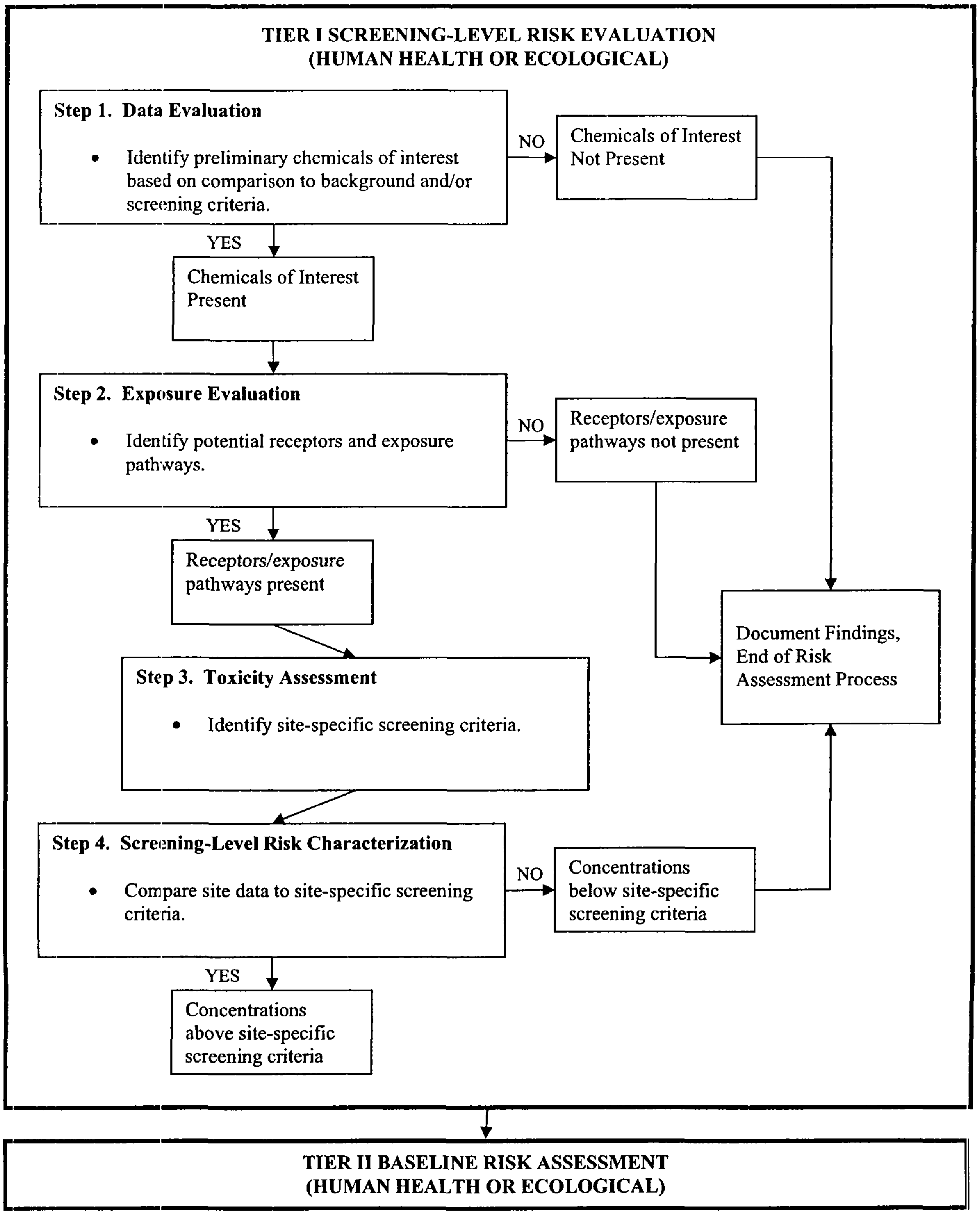
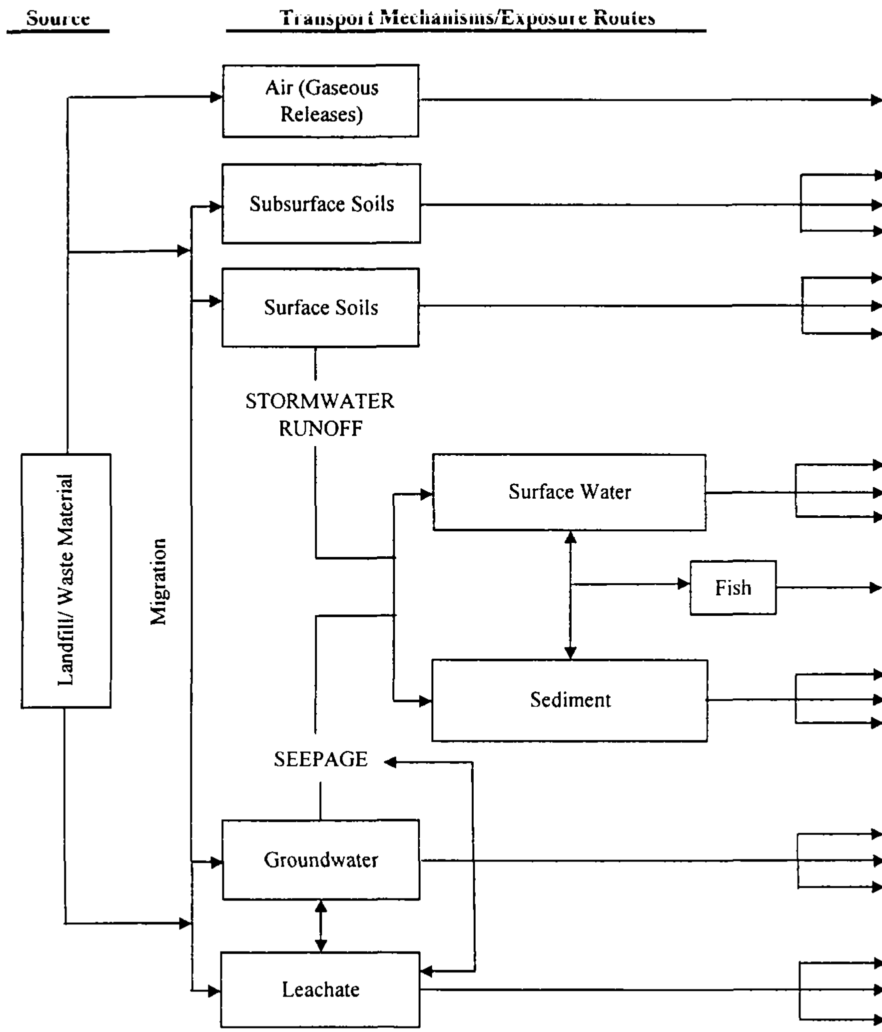


Figure 4

Ford Road Landfill Site
Elyria, Ohio

Conceptual Site Model: Human Health Evaluation



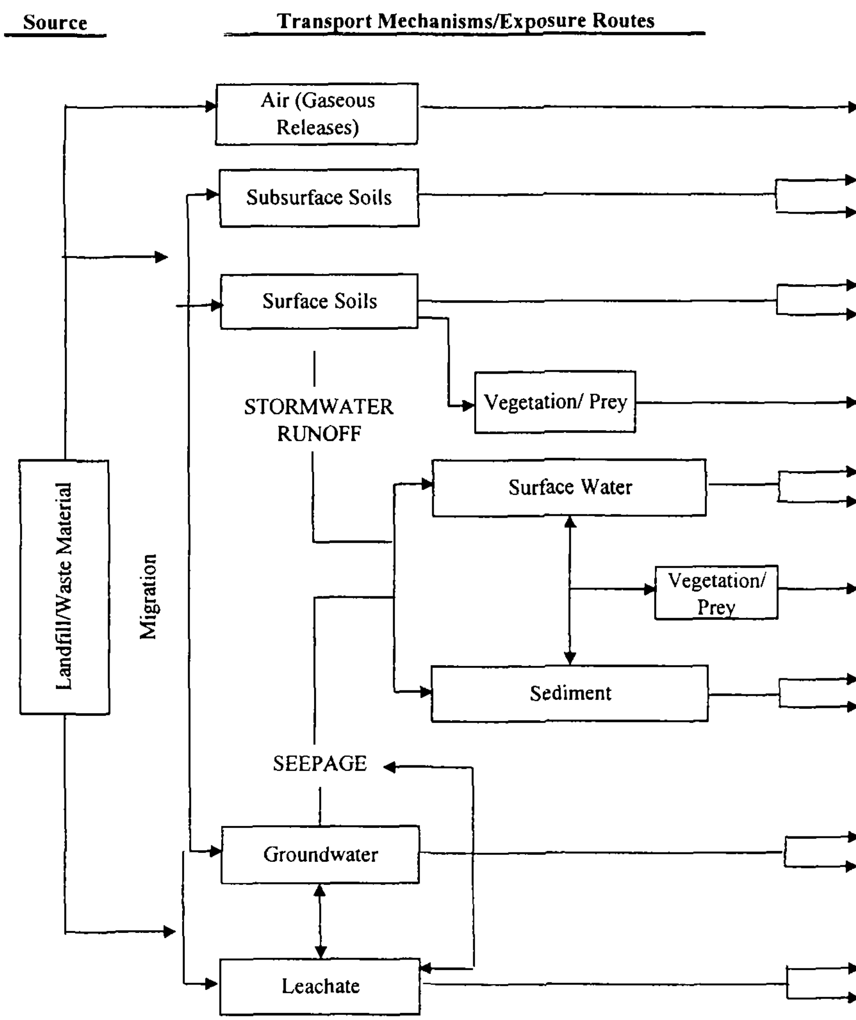
Exposure Pathways	Potential Receptors: Trespasser	Worker	Resident	Recreational
Inhalation	X	X	X	X
Dermal Contact	X	X	X	X
Ingestion	X	X	X	X
Inhalation	X	X	X	X
Dermal Contact	X	X	X	X
Ingestion	X	X	X	X
Inhalation	X	X	X	X
Dermal Contact	X		X	X
Ingestion	X		X	X
Inhalation	X		X	X
Ingestion			X	X
Dermal Contact	X		X	X
Ingestion	X		X	X
Inhalation	X		X	X
Dermal Contact			X	
Ingestion			X	
Inhalation			X	
Dermal Contact	X		X	X
Ingestion	X		X	X
Inhalation	X		X	X

Notes:
1) X denotes that this is a potentially complete exposure pathway which may be evaluated in the human health evaluation.

Figure 5

Ford Road Landfill Site
Elyria, Ohio

Conceptual Site Model: Ecological Evaluation

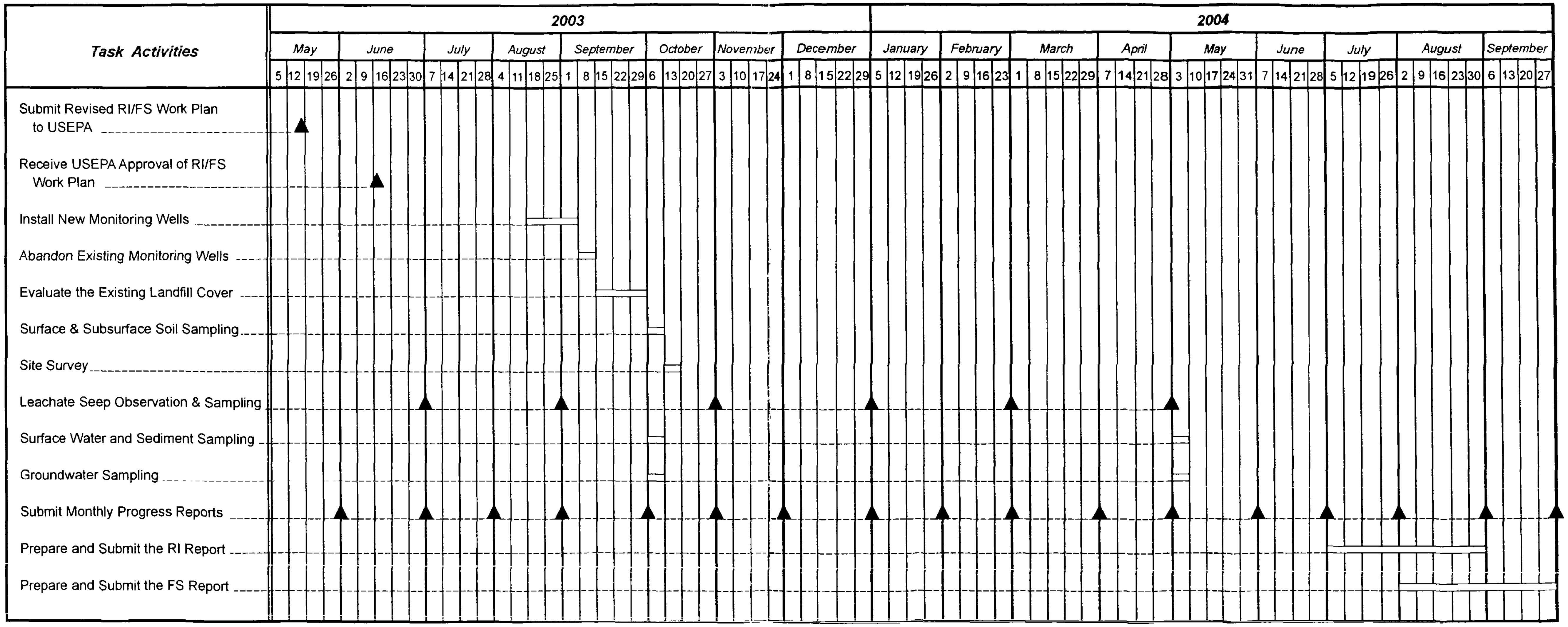


Exposure Pathways	Invertebrates	Reptiles and Amphibians	Birds	Mammals	Fish
Inhalation					
Direct Contact/Absorption	X	X	X	X	
Ingestion	X	X	X	X	
Direct Contact/Absorption	X	X	X	X	
Ingestion	X	X	X	X	
Ingestion	X	X	X	X	
Direct Contact/Absorption	X	X			X
Ingestion	X	X			X
Ingestion	X	X	X	X	X
Direct Contact/Absorption	X	X			X
Ingestion	X	X			X
Direct Contact/Absorption					
Ingestion					
Direct Contact/Absorption	X	X	X	X	
Ingestion	X	X	X	X	

(Potential Receptors: Invertebrates, Reptiles and Amphibians, Birds, Mammals, Fish)

Notes:

1) X denotes that this is a potentially complete exposure pathway which may be evaluated in the ecological risk assessment.
2) The inhalation pathway is typically not evaluated for ecological risk assessment and is not included for most media.



FORD ROAD LANDFILL
ELYRIA, OHIO
RI/FS WORK PLAN

SCHEDULE OF RI/FS ACTIVITIES

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FIGURE
6

05/01/03 SYR-D54-DJH
42433001/42433j05.cdr

Attachments

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Attachment 1

Quality Assurance Project Plan

(bound separately)

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Attachment 2

Health and Safety Plan

(previously submitted)

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